Medical Library

# The Research Quarterly

of the

American Association for Health, Physical Education, and [illegible]

VOL. X MAY, 1939 No. [illegible]

Elementary Principles and Techniques of Cinematographic Analysis. *Thomas Kirk Cureton, Jr.* . . . . . [illegible]
A Bibliography of Textbooks in Health Education for the Elementary and High Schools. *E. P. Kilander* . . . . . [illegible]
An Analysis of the Components of Tests of Semicircular Canal Function and of Static and Dynamic Balance. *Anna [illegible]*
A Health Knowledge Survey. *David T. Loy, M.D., and M. W. [illegible]*
The Fair Sex in Greek Society. *Thomas Woody* . . . . . [illegible]
Vital Capacity in Trunk Deformities. *K. G. Hansson, M.D.* . . . . . [illegible]
A Study of the Content of Professional Courses in Physical Education. *Tom Scott* . . . . . [illegible]
A Study of Teaching Difficulties in Physical Education. *Elizabeth Graybeal* . . . . . [illegible]
The Factor of Age in Teaching Physical Education. *L. Joseph Cahn* . . . . . [illegible]
The Civilian Conservation Corps as a Builder of Physical Fitness in Youth. *G. A. Walker* . . . . . [illegible]
Vitality Indexes for Summer Camps. *C. S. Alexander* . . . . . [illegible]
A Selected Bibliography of the Dance in Health, Hygiene and Physiology. *Paul David Mageriel* . . . . . [illegible]
The Status of Physical Education for Boys in the State Accredited Class A High Schools for Negroes in Texas. *John E. Codwell* . . . . . [illegible]
University of Minnesota Study of Physical Education Facilities and Equipment. *Carl L. Hardly* . . . . . [illegible]
A Study of the Comparative Recreational Values of Volleyball with Team Games, Dual, and Individual Activities for College Women. *Hiawatha Crosslin* . . . . . [illegible]
A Comparison of Two Methods of Teaching Hygiene to College Freshmen. *F. S. Keet, M.D., and H. A. Prentice* . . . . . [illegible]
The Sociological Contributions of Physical Education to the Needs of the Negro. *William M. Bell* . . . . . [illegible]
Sports Interests and Attitudes of Students Enrolled in the Service Curriculum. *H. W. Craig* . . . . . [illegible]
Effect of the Elimination of the Center Jump on the Game of Basketball. *Wilho Frigard* . . . . . [illegible]
A Motion Picture Questionnaire. *Jenny E. Turnbull* . . . . . [illegible]
Book Reviews . . . . . [illegible]

Published March, May, October, and December
Address: 311 Maynard, Ann Arbor, Michigan Subscription $3.00 per year

PERIODICALS
BOOKS
GENERAL PRINTING

Prompt Service
Workmanship
Moderate Prices

*Ask for Quotations*

THE ANN ARBOR PRESS
317 Maynard Street
Ann Arbor Michigan

Copyright 1930 by American Association for Health, Physical Education, and Recreation
Entered as second class matter March 22, 1930, at the Post Office at Ann Arbor, Michigan, under the act of March 3, 1879.

Medical
Dorit
9-15-42

# *The* Research Quarterly

*of the*

**American Association for Health, Physical Education, and Recreation**

**Vol. X** **MAY, 1939** **No. 2**

## CONTENTS

Elementary Principles and Techniques of Cinematographic Analysis. *Thomas Kirk Cureton, Jr.* ..... 3
A Bibliography of Textbooks in Health Education for the Elementary and High Schools. *H. F. Kilander* ..... 25
An Analysis of the Components of Tests of Semicircular Canal Function and of Static and Dynamic Balance. *Ruth I. Bass* ..... 33
A Health Knowledge Survey. *David T. Loy, M.D.*, and *M. W. Husband* .... 53
The Fair Sex in Greek Society. *Thomas Woody* ..... 57
Vital Capacity in Trunk Deformities. *K. G. Hansson, M.D.* ..... 72
A Study of the Content of Professional Courses in Physical Education. *Tom Scott* ..... 78
A Study of Teaching Difficulties in Physical Education. *Elizabeth Graybeal* 84
The Factor of Age in Teaching Physical Education. *L. Joseph Cahn* ..... 92
The Civilian Conservation Corps as a Builder of Physical Fitness in Youth. *G. A. Walker* ..... 97
Vitality Indexes for Summer Camps. *C. S. Alexander* ..... 102
A Selected Bibliography of the Dance in Health, Hygiene, and Physiology. *Paul David Magriel* ..... 113
The Status of Physical Education for Boys in the State Accredited Class A High Schools for Negroes in Texas. *John E. Codwell* ..... 115
University of Minnesota Study of Physical Education Facilities and Equipment. *Carl L. Nordly* ..... 122
A Study of the Comparative Recreational Values of Volleyball with Team Games, Dual, and Individual Activities for College Women. *Hiawatha Crosslin* ..... 128
A Comparison of Two Methods of Teaching Hygiene to College Freshmen. *F. S. Kent, M.D.*, and *H. A. Prentice* ..... 133
The Sociological Contributions of Physical Education to the Needs of the Negro. *William M. Bell* ..... 137
Sports Interests and Attitudes of Students Enrolled in the Service Curriculum. *H. W. Craig* ..... 143
Effect of the Elimination of the Center Jump on the Game of Basketball. *Wilho Frigard* ..... 150
A Motion Picture Questionnaire. *Jenny E. Turnbull*..... 154
Book Reviews ..... 157

CONTRIBUTING EDITORS

G. B. Affleck
Dorothy Ainsworth, Ph.D.
V. S. Blanchard
John Bovard, Ph.D.
David K. Brace, Ph.D.
A. D. Browne, M.D.
C. L. Brownell, Ph.D.
Rosalind Cassidy, Ed.D.
Charles C. Cowell, Ph.D.
Frederick Cozens, Ph.D.
A. Lester Crapser, Ph.D.
Ruth Elliott, Ph.D.
Marguerite M. Hussey, Ph.D.
Peter V. Karpovich, M.D.
Charles H. Keene, M.D.
Frank L. Kleeberger
C. V. Langton, D.P.H., Ed.D.
William R. LaPorte
Mabel Lee
Frank Lloyd, Ph.D.
F. W. Luehring, Ph.D.
C. H. McCloy, Ph.D.
J. H. McCurdy, M.D.
C. M. Miles, Ph.D.
Gertrude E. Moulton, M.D.
Jay B. Nash, Ph.D.
N. P. Neilson, Ph.D.
D. Oberteuffer, Ph.D.
W. W. Patty, Ph.D.
Frederick Prosch
F. R. Rogers, Ph.D.
Harry A. Scott, Ph.D.
J. R. Sharman, Ph.D.
George T. Stafford, Ed.D.
Arthur H Steinhaus, Ph.D.
Alden W. Thompson
W. W. Tuttle, Ph.D.
Agnes Wayman
Jesse F. Williams, M.D.

Published March, May, October, and December
ELMER D. MITCHELL, Ph.D., *Editor*
311 Maynard Street, Ann Arbor, Michigan
Subscription $3.00 per year Single Copies, $1.00 each

# American Association for Health, Physical Education, and Recreation

**Officers**

President, F. W. Cozens, University of California at Los Angeles
President-Elect, Dr. Margaret Bell, University of Michigan
Past President, C. H. McCloy, State University of Iowa
Vice-President (Health Education), Dorothy Nyswander, Astoria, N. Y.
Vice-President (Physical Education), Grover W. Mueller, Philadelphia
Vice-President (Recreation), F. S. Lloyd, New York University
Executive Secretary-Treasurer, N. P. Neilson, Washington, D. C.

**Additional Members of Governing Board**

Central District, Elizabeth Halsey
Eastern District, Hiram A. Jones
Mid-West District, W. K. Streit
Northwest District, E. E. Boushey
Southern District, T. E. McDonough
Southwest District, Louise Cobb
Members-at-large, Dr. Gertrude E. Moulton, Jay B. Nash, C. E. Turner

**Officers of Eastern District Association**

Pres., Dr. Hiram A. Jones, Albany, N. Y.
Vice-Pres., Loretta Ryan, New York City
Sec.-Treas., Grace E. Jones, Summit, N. J.

**Officers of Mid-West District Association**

Pres., W. K. Streit, Cincinnati, Ohio
Vice-Pres., Helen Hazelton, Purdue University
Sec.-Treas., August Pritzlaff, Chicago

**Officers of Central District Association**

Pres., Elizabeth Halsey, Iowa City, Ia.
Pres.-Elect, Willard N. Greim, Denver, Colo.
Vice-Pres., Gertrude Baker, Univ. of Minn.
Sec.-Treas., J. H. Morrison, Aberdeen, S. D.

**Officers of Southern District Association**

Pres., T. E. McDonough, Richmond, Ky.
Pres.-Elect, Anne S. Duggan, Denton, Texas
Vice-Pres., A. W. Hobt, Univ. of Tenn.
Sec., J. R. Sharman, Univ. of Alabama
Treas., J. W. Hair, Baton Rouge, La.

**Officers of Northwest District Association**

Pres., E. E. Boushey, Eugene, Oregon
Pres.-Elect, Helen G. Smith, Pullman, Wash.
Vice-Pres., Dorothea Lensch, Portland, Ore.
Sec.-Treas., Leonard Mayfield, Grant's Pass, Oregon

**Officers of Southwest District Association**

Pres., Louise S. Cobb, Berkeley, Cal.
Vice-Pres., Dudley De Groot, San Jose, Cal.
Sec.-Treas., Bernice Moss, Salt Lake City, Utah

**Additional Members of Legislative Council**

Administrative Director's Section: M. H. Trieb
Administrative Measurement Section: Ruth Bass
Alabama: Fleta McW. Dowling
American Academy of Physical Education: Dr. Arthur H Steinhaus
Arizona: Ina Gittings
Arkansas: Mrs. W. E. Bates
California: Melvin Chase, Grover Gates, F. L. Kleeberger
Camping Section: Martin Feely
Canada: Dr. A. S. Lamb
College Men's Physical Education Section: S. C. Staley
College Physical Education Association: C. L. Brewer
Colorado: Willard N. Greim, Clare Small
Connecticut: Frances Foley, H. J. Schnelle
Dance Section: Mrs. Barbara Page Beiswanger
Delaware: C. Walter Kadel
District of Columbia: Jenny Turnbull
Florida: Dr. E. Benton Salt
Georgia: Mrs. H. S. Wootten
Health Education Teacher Training Section: Anita D. Laton
Health Instruction Section: W. L. Hughes
Illinois: Jack Haskin, C. E. Horton, Dr. S. C Staley
Indiana: L. L. Messersmith, Ben W. Miller
Intramural Athletics Section: R. O. Coleman
Iowa: P. F. Bender, John Johnson, Ruth Zieke
Kansas: Ruth Hoover, E. A. Thomas
Kentucky: H. T. Taylor
Louisiana: Jess Hair
Maine: Helen Lengyel
Maryland: Mora J. Crossman
Massachusetts: T. H. Hines, Eleanor H. Quinlan
Men's Athletic Section: Paul Washke
Mental Health Section: Alfred Kamm
Michigan: Roy McMurray, Mabel Rugen, Grace Ryan
Minnesota: H. K. Jack, C. L. Nordly
Missouri: Darwin Hindman, Helen Manley
Montana: Erma Monroe
National Association of Directors of Physical Education for College Women: Dorothy Ainsworth
National Collegiate Athletic Association: Dr. J. H. McCurdy
Nebraska: Ruth Diamond
New Hampshire: Raymond Hoyt
New Jersey: Dr. A. G. Ireland, Helena Kees, Marianna Packer
New York: E. H. Champlin, Dr. H. A. Jones, C. J. Kraft, Jr., Paul Krimmel
North Carolina: Christine White
North Dakota: G. E. Whitlock
Nutrition Section: Carlotta Greer
Ohio: S. R. Boyd, Helen Coops, Lewis S. Moorehead
Oklahoma: Flora May Ellis, Miller Patterson
Oregon: L. J. Sparks
Pennsylvania: Archie Dodds, W. F. Meredith, Elizabeth McHose, Frederick Prosch
Phi Delta Pi: Mrs. Gret Hendricks
Private Schools Section: Capt. W. A. Palmer
Public Schools Section: A. H. Pritzlaff
Recreation Leadership Section: A. W. Thompson
Recreation Program Section: C. L. Glenn
Recreation Research Section: C. P. L. Nichols
Research Section: J. F. Bovard
Rhode Island: Helen Cooper
Safety Section: C. W. Davis
School Nurses' Section: Lulu V. Cline
School Physicians' Section: Dr. Don W. Gudakunst
Society of State Directors: W. H. Orion
South Carolina: Frances Major
South Dakota: J. H. Morrison
Teacher Training Section: H. M. Foster
Tennessee: A. W. Hobt
Texas: Dr. D. K. Brace, G. L. Hermance, Dr. Harry A. Scott
Therapeutics Section: Claire Colestock
Utah: Mrs. Alice O. Bronson
Vermont: Mrs. Alice C. Aldrich
Virginia: Grace Chevraux
Washington: Helen G. Smith, Leslie L. Hoar
West Virginia: Grace Griffin, Harry L. Samuel
Women's Athletic Section: Jane Shurmer
Women's Division, N.A.A.F.: Anne F. Hodgkins
Wisconsin: Robert Francis, Elizabeth Rodgers
Y.M.C.A. Physical Directors' Society: Dr. John Brown, Jr.
Y.W.C.A. Health Education Directors' Society: Edith M. Gates

# Elementary Principles and Techniques of Cinematographic Analysis as Aids in Athletic Research

By Thomas Kirk Cureton, Jr.
*Professor of Health and Physical Education*
*Springfield College, Springfield, Massachusetts*

MOST athletic textbooks contain pictures of outstanding athletes in action or in some assumed pose. Few of these are analytical and lend little or no aid in deriving the principles of expert performance. They are usually included to add selling value and human interest. A marked increase may be noted, however, in the serious studies which aim to analyze athletic performances for the following purposes:

1. To estimate the major factors governing performance and their relative importance.

2. To derive the scientific principles of coaching, including an understanding of the physical mechanics of the skill.

3. To lay the basis for a philosophical interpretation of athletic performance based upon relatively accurate theoretical considerations subject to some degree of verification.

We may think of the usual class in professional methods courses viewing films of outstanding athletes in action. Very seldom does the student connect the acts as seen in the film with fundamental principles of mechanics. Two major reasons explain this discrepancy; firstly, professional major students of physical education seldom understand elementary principles of mechanics as they are contained in physics; secondly, the science of analyzing skills in terms of fundamental scientific principles is in its infancy. The professional books on kinesiology have aimed to analyze athletic action but usually do so in terms of multitudinous names of muscles, tendons, and bones. While some of these considerations are important, the writer is impressed much more with the necessity of interpreting athletic action in terms of the physical principles governing movements of the body mass as a whole, this to be supplemented then by other considerations involving the internal body mechanics, physiology of training, and psychology of competition. All of these aspects are important but the mechanical analysis is basic.

A paper presented before the Research Section of the Eastern District Association, April 1938, Atlantic City.

## HISTORICAL DEVELOPMENT OF THE CINEMATOGRAPHICAL METHOD AS AN AID TO BODY MECHANICS ANALYSIS

While many workers contributed to the development of the principles of physics applicable to movements of the human body previous to his time, Kohlrausch,[28]* in 1887, made extensive applications of physics to the human body performing various gymnastic movements. Previous to Kohlrausch's work, Aristotle, Galen, Archimedes, Galileo, De la Hire, Amontons, Franklin, Coulomb, Arnott, Wilhelm and Eduard Weber, Jourdan, A. Fick, Giraud-Teulon, Pettigrew, Harleb, Quetelet, Meyer, Haughton, Hermann, Marey, Regnault and Raoul, McGregor-Robertson, and others contributed important applications of physics to the action of the human body. These studies are summarized in part by Amar [1] and by Cureton.[5] *It may be said, however, that genuine progress in the analysis of rapid movement began with the development of cinematography.*

Experiments were begun in 1872 by Eadweard Muybridge, at Sacramento and Palo Alto, California, which led to more extensive applications of the method. The pioneering experiments on the nature of paces of racing horses were sponsored by Leland Stanford on a site which is now Leland Stanford University. McKay [32] describes this early development but there are many other reports, including those by Stillman,[44] Nitzsche,[39] and the original materials of Muybridge,[35,36,37]

Muybridge published his results in 1878 and these created wide attention both in this country and abroad. Professor E. J. Marey, of Paris, had established a laboratory for the scientific study of movement and it was in this laboratory that Muybridge made his first European demonstration in 1881. In 1892 Marey published his own booklet, "La Photographie du Mouvement."[31] In 1894 he published his novel study of the cat making a complete rotation of the body under the influence of interior muscular forces. This debatable problem was solved by photographic analysis and the application of Marey's knowledge of mechanics. Many of the non-cinematographic attempts to analyze movement were very awkward and so focused upon the isolated action of muscles that the application of the laws of mechanics to the body as a whole mass, or to parts, were not clear.

The application of the cinematographic approach attracted Georges Demeny, outstanding kinesiologist and leader of physical education, contemporary with Marey. He made many applications of the method from 1895 to 1899 and describes his apparatus in his book, "Les Bases Scientifique de L'Éducation Physique." [14] The following quotation taken from this famous work is classic:

> Opinions constitute only probabilities without scientific value. . . . Some so-called authorities disputed for years the nature of the paces of the horse; photography solved the question and destroyed the prejudices ingrained in

* Numbers refer to Bibliography at the end of the article.

the experts. . . . A problem does not solve itself: it is necessary to bring to its solution the resources of scientific method. . . . The problem of physical education is susceptible of precision, it must be attacked by every means at the disposal of modern science; each time that one has taken the pains to measure, the ideas have become clearer; to employ a new instrument of measurement is to render more service to the cause than to form preconceived opinions or criticisms. . . . Physical education must perfect itself without ceasing, the pedagogical manuals must be reviewed; this work of revision will be singularly facilitated if one can rest the reforms on experimental findings. . . . A laboratory of research for the study of physical perfection must take into account the apparatus for measuring bodily movement, a laboratory of photography, cinematography, X-ray, and time recording. This installation should permit making cinematographical studies by solar or artificial light.

This scientific attitude probably explains why Demeny wrote the greatest book on kinesiology of that, and possibly any subsequent period, "Méchanisme et Éducation des Mouvements."

## RELATIONS BETWEEN CINEMATOGRAPHICAL ANALYSIS AND MECHANICS

Fairly precise analysis of the *external* mechanics of many acts of skill may be made by cinematography. The fundamental principle is that directions of movement (angles), dimensions, time relations, and indirect values of force and velocity may all be obtained from the projected film. Since the science of mechanics is an expression of physical laws of equilibrium or movement in terms of these same fundamental or derived measurements, a mechanical analysis of any movement may be made from measurements taken from the screen. Cinematographical analysis consists of the techniques for making these measurements. Thus, athletic performance can be studied and interpreted in terms of recognizable scientific principles instead of the empirical guesses and vague suppositions which have largely characterized the coaching of sports literature up until very recently.

## ELEMENTARY TECHNIQUES

*Equipment.*—It is not the purpose of this article to treat equipment but it seems necessary to mention a few minimum essentials. Any ordinary 16 mm. camera may be used for work on films. The inexperienced worker will find a good review of "Motion Picture Cameras and Equipment" reported in *Consumers' Digest* for March of last year.[4] It is very advantageous to have a variable speed camera with ordinary and telephoto lens. A tripod is important and preferably one which locks. An editing outfit will be found essential. The Filmo Enlarger made by Bell and Howell is very useful for a 16 mm. projector. The operation is described in *Scientific American*[15] and also in the Bell and Howell

pamphlet (Form 15,000-E, 1/21/29). Pictures 2¼" x 3¼" may be made directly from the 16 mm. film with the enlarger.

There is great advantage in a 35 mm. camera of the "Eyemo" type because the negative film may be printed directly to make pictures of the same size for reproduction. These are large enough to be useful, but they may be enlarged to make better reproductions than the 16 mm. enlargements.

Glassow and Broer [20] have described a convenient apparatus for the study of films.

One of the real difficulties is burning the film when used in high wattage projectors. While the 250- or 400-watt projector may be used, the writer found that a Model No. E 67 Keystone Projector serves for class experimentation. This model is equipped with a hand crank, variable speed control, low wattage lamp, and has the film track separated from the lamp almost 2 inches. This absolutely prevents burning the film. Overheating the film will cause it to shrivel and shrink. The ones used at Springfield cost $5.00 each.

The technique of taking pictures is not elaborated. There are numerous manuals describing procedure, such as the one by McKay.[32]

Even if one does not take pictures, there are numerous sports films which may be purchased or rented. Hughes and Stimson [24] have recently made a survey of these. Louise Kjellstrom [25] has rendered some valuable "Reports of the Motion Picture Committee" which will aid one in obtaining the best sport films.

## APPLICATIONS OF CINEMATOGRAPHIC ANALYSIS

Many varied applications of the elementary analytical techniques are possible. When applied to swimming, running, jumping, throwing, pitching, batting, kicking, vaulting, gymnastics, and, in fact, to any of the high speed or precision activities, the resulting film, serving as the source of measured data, becomes invaluable. Measurements have been applied to the javelin in flight with an average of 3.3 per cent experimental error. Measurements on the human body in action have been made with a routine experimental error less than one per cent, including activities such as giant swings and up-starts in the gymnasium, somersault dives and the flutter kick in swimming, the high jump and broad jump in track, as well as many other athletic skills. The number of applications are limitless.

*Measuring Angles.*—Angular measurement has the great advantage of requiring no multiplier or correction factor to obtain true size dimensions, except as there may be aspects of perspective, field, lens, or photographic errors involved. The angles are scaled directly with a protractor. The film is placed in the projector and projected on a flat vertical surface with the lens directed horizontally and perpendicular

to the screen, or surface.* The angles are scaled directly with a protractor. In Illustration I a shot putter is shown projecting the shot at an angle of 40 degrees.

The angular measurement may be effectively used to measure body lean in running, angular relations of the limbs and trunk, the angle of take-off in the broad jump, high jump, or pole vault, the range of ankle action in the flutter kick photographed under water, the angular relation of the head with the trunk in walking posture, and many other similar relations. In swimming the angular separation of the legs in the frog kick, the planing angle of the body, the angle of lean at the moment of taking-off for a dive from the springboard, are all easily measured, as are the angulations between body segments in various

ILL. I. Angle of Projection of Shot.

diving postures. This is the most feasible method of studying the range of movement of parts of the body in all types of dynamic exercises.

In the case of solid objects of symmetrical shape, like the shot, the center of the object is estimated and one of the angle lines is drawn through this. In some instances of work with the human body, it is important to be able to estimate the center of gravity closely.† In joint action, the apex of the angle of movement may be taken as the point at which the sides of the angle join.

Thus it was determined that the angle of take-off of the shot in the case of good shot putters is 40-42 degrees at the hand, and 45 degrees contact with the ground when maximum distance is obtained. Johnny Weismuller was shown to have a range of ankle action of nearly 90 degrees at a time when some teachers were insisting upon a straight rigid ankle.[6]

*Measuring Linear Distances.*—Projected images on the screen are usually not true life size. The size of the image varies directly as the distance from the lens to the screen. The further the projection lens away, the larger is the image, and vice versa. If, however, some dimen-

* Cardboard may be used to preserve the tracing of the projected image. This is not very convenient for mailing as it will not roll. Special paper, tracing cloth, or roll map cloth may be used.

† The works of Braune and Fischer and the tables in "Daten und Tabellen" by H. Vierordt will be found helpful on this problem. Fenn [17] deals with the problem in an American reference source.

sion is known which appears in the picture, corrections may easily be made. These corrections are known as *reduction factors* or *multipliers*. For instance, Weismuller's true height from top of head to tip of the toe in the swimming position is 74″. When measured on the screen with a given location of the projector and screen, the same distance measured 41.2 centimeters. Each centimeter on the screen is, therefore, equivalent to

$$\frac{74 \text{ in.}}{41.2 \text{ cm.}} = 1.797 \text{ inches} = \text{Multiplier}$$

Every measurement on the screen must be multiplied by this factor to bring the measurements up to true size. Weismuller's kick measured at the narrowest beat 8.2 cm. or 3.2 inches. Its real width is 8.2 x 1.797 = 14.7 inches.

It is always important to measure some object or dimension in the field being photographed. Neglect to do this will spoil the possibility of determining the true size of various measurements taken from the screen. To preserve these a written memorandum is needed. It may be helpful to include a numbered card in the visual field and use this number as a key for further reference. Trigonometric methods may be used to determine the distance or size of objects far away when no direct measurement of an object in the field is possible. It is usually helpful tc try to locate a horizontal line in the field, such as, the top of a level fence, or horizontal roof line on a house.

Such measurements of length are usually quite accurate if the pictures are clearly defined. The usual technique is to measure a vertical and horizontal dimension on some object in the field being photographed. Careful record and description should be made of these measurements, using numbered cards in the picture and a diary record to avoid confusion later.

Very minor errors may occur in such linear measurements. A straight line may not photograph as such because of buckling of the film in the projector, or of similar buckling of the negative in the plate holder of a camera.

*Measurements of Speed and Force.*—Among the more important types of measurements are those of speed, and indirect measurement of force by its calculation from physical formulas.

Measurement of velocity is based upon the relation:

$$\text{Velocity} = \frac{\text{Distance}}{\text{Time}} = \text{Speed}$$

It is thus necessary to measure the distance moved by the body, or body part or object being studied, and to count the number of *frames* or *clicks* in the projector mechanism during the action. For instance, in our laboratory Bell & Howard projector, there are three

clicks to each frame of the film. It becomes less confusing to work in terms of clicks rather than total frames.

In order to time the film the usual procedure is to photograph a falling object in the same field as the action being timed (Illustration II).

ILL. II. Timing the Film by Photographing a Falling Object.

However, for routine work this may be done once with the camera spring tightly wound. If the camera is rewound after each shot, it is not necessary to photograph a falling object each time.

The calculation involves the law of falling bodies:

$S = \frac{1}{2} g t^2$ wherein, $S$ = distance in feet
$g = 32.2$ feet/sec.$^2$ (acceleration due to gravity)
$t$ = time in seconds.

Photograph a heavy white ball released from a measured height and its fall downward to strike a smooth hard surface on the ground. In the example,

$$S = 6.75 \text{ feet (actually measured)}$$
$$6.75 = \tfrac{1}{2} g t^2$$
$$t^2 = \frac{6.75}{16.1} = .419 \text{ seconds.}$$
$$t = .419 = .65 \text{ seconds.}$$

(Stop watch time, average of six trials .662 seconds)

The number of shutter clicks from start to finish were counted to be 28. Therefore, the time per click equals $\frac{.65}{28} = .023$ sec.

Each counted frame should be multiplied by .023 to convert clicks to seconds of time.

The accuracy of this procedure may be checked by photographing the fall of the weights on an Atwood machine, or an apparatus which traces vibrations of an electrical timing fork on a smoked glass surface. Since the time of each vibration is known from the rating of the fork, the vibrations may be counted and the total time compared with the photographic result. Another approximate check is to time with a stop watch the falling object. The latter is only a rough check but agreement can be shown to better than 1/10th of a second over an average of a series of trials when the person serving as timer also drops the ball, thus eliminating the reaction time error at the start.

An application may be given to determining the velocity with which a baseball leaves a pitcher's hand. A very fast speed camera was used. A 69-inch drop of an iron ball corresponded to 235 clicks. The time per click was computed to be .00255 seconds, corresponding to 130.7 frames per second exposure.

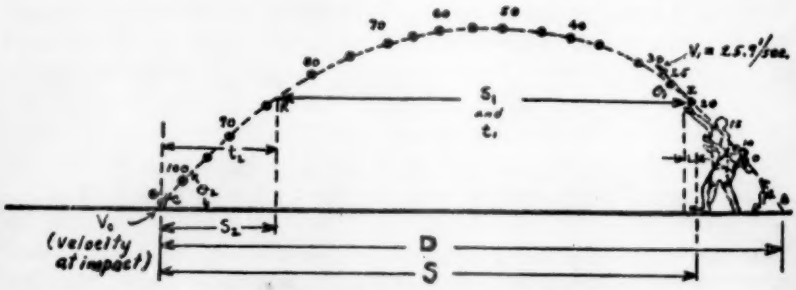
The ball was measured for velocity in a 4.00 ft. distance just after leaving the hand. Twenty clicks were counted corresponding to the time. Dividing the distance by the time gives an average velocity of 80.0 ft./sec., or 26.6 yards/sec., or 54.5 miles/hour for the speed.

Many other interesting applications are possible. The take-off velocity in jumping and running reflects the effectiveness of the release and application of power. The parabolic flight of any jumper, diver, or thrown object follows the mechanical laws of projection.

$S_1 = V_1 t_1 \cos \sigma_1$ wherein $S_1$ = Distance in feet.
$t_1$ = Time in seconds.
$V_1$ = Projection velocity.
$\sigma_1$ = Angle of projection.

In the above formula the assumption is that the object returns to the same elevation from which it started. With a shot leaving the hand about seven feet from the ground, a correction must be applied from the further point in the trajectory which is level with the hand to the ground, horizontally applied.

In Illustration III there is an actual reproduction of a shot put.




Ill. III Analysis of Shot Put.

The shot follows a parabolic course of flight and covers distance S. If the shot had departed from point B and landed at point C, the above given formula would apply. In reality, the shot left the hand at point Z, 7.3 feet above the ground. The modified formula which provides the necessary corrections is as follows:

$S_1 = V_1 \cos \sigma_1 \ t_1$
$S_2 = V_0 \cos \sigma_2 \ t_2$
$L =$ Correction to toe board.
$S = S_2 + S_1 + L$

$V_1$ (velocity of shot leaving the hand)
$\sigma_1$ (angle at which shot left the hand)
$t_1$ (time of flight in upper parabola $Z$ to $R$)
$t_2$ (time of shot in falling from $R$ to $C$)
$V_0$ (velocity of shot in striking the ground)
$\sigma_2$ (angle of contact with ground)

In the above problem the computed distance was 37.53 feet and the actually measured distance from the toe board was 37.5 feet.[10]

Force may be computed but not measured directly. Three basic physical formulas are involved:

$$\text{Power} = \frac{\text{work}}{\text{time}} = \frac{\text{Force} \times \text{Distance}}{\text{time}}$$

$$= \frac{F \times S}{t} = F V$$

$$\text{Work or Kinetic Energy} = \text{Force} \times \text{Distance}$$
$$F D = \tfrac{1}{2} M V^2$$

Memery and Cornell [84] applied photographic data to these formulas, and derived important principles for the shot-put technique. They found that the force and power with which athletes can extend the arm against the weight and inertia resistance of the shot definitely increase in proportion to the extent with which the body is brought into play. Power was computed to equal 108.77 ft. lbs./sec. in the put from a standing position without shift or leg swing. This increased to 159.99 ft. lbs./sec. with the addition of the supplementary body movements. Photographic measurements have enabled the collection of basic data which have permitted building prediction equations for shot putting, which when applied to any selected individual make coaching diagnosis of great value.

Knight and Hepp made a similar analysis of the track racing start at Springfield College. By combining photographic analysis with electrical timing of the start, basic data were collected that has permitted

the close prediction of the short sprint time. They used the physical equation of Newton (2nd law of motion):

$$F = M\,a \text{ or } F = \frac{W}{g}\,a$$

$F$ = force in lbs.
$W$ = body weight in lbs.
$a$ = acceleration.

Photographic measurement of the acceleration factor, and simple measurement of the $\frac{W}{g}$ factor enabled the computation of propelling force in the running. The time in the short sprint can be closely predicted from the force and angle of body lean.

Attention should be called to the extensive use of cinematographic analysis by Wallace Fenn in his excellent studies of sprinting.[16,17,18] Studies have been reported by the writer on the shot put, high jump, broad jump, running, and the track racing start.[8,9,10,11,12]

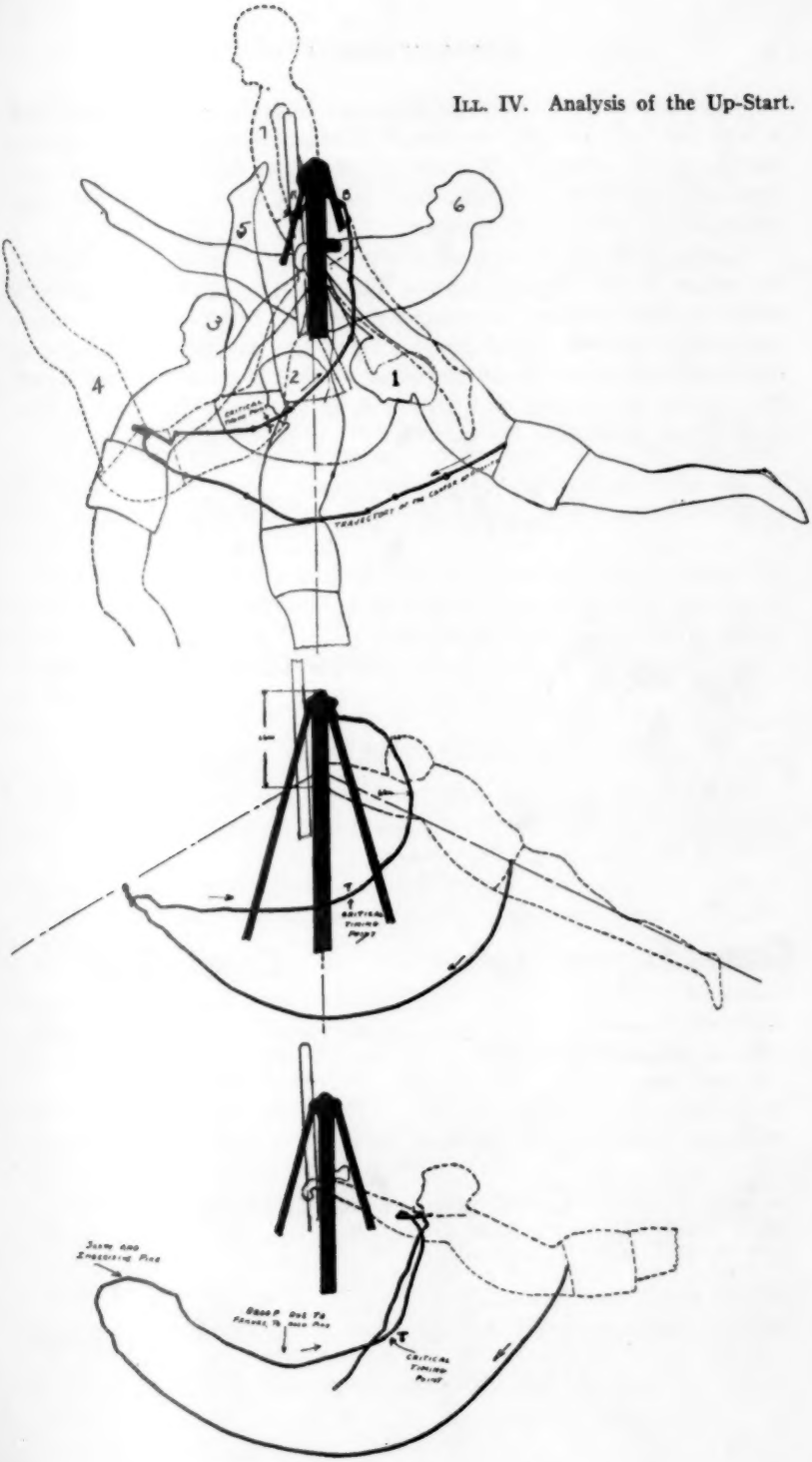
These studies and others indicate that precise knowledge of the factors governing athletic performance are in the making, and soon there will be available a body of scientific principles which will establish coaching on more of a recognizable scientific basis.

## FURTHER TYPICAL EXAMPLES OF ANALYTICAL CINEMATOGRAPHICAL-MECHANICAL STUDIES

Harris [21] made an interesting analysis of the gymnastic up-start. Subjects of excellent, medium, and poor ability were photographed in the gymnasium while executing the up-start under prescribed conditions. A diary was kept of each act photographed. In Illustration IV three examples are shown for comparison with each other.

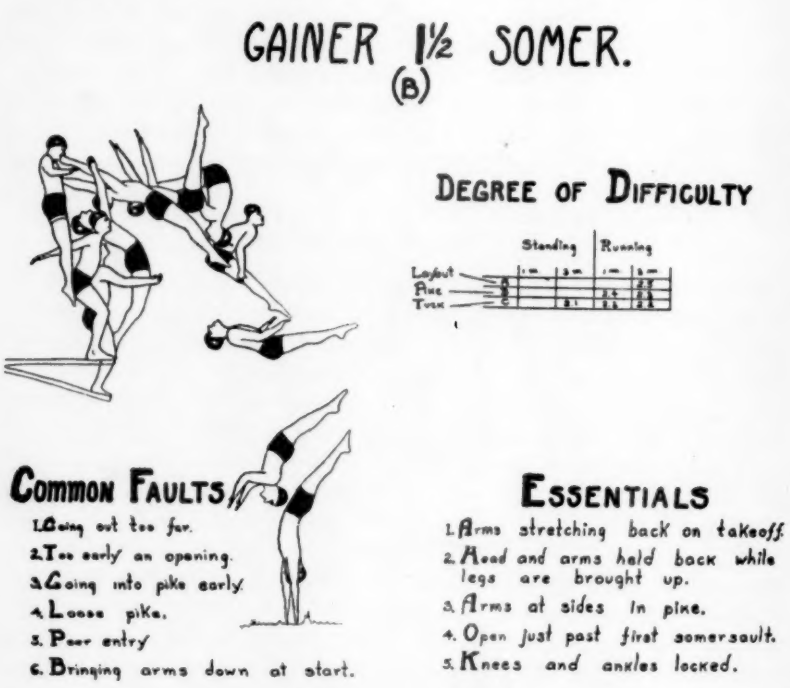
In the top example subject Welser executes an up-start with good form. The tracing of the center of gravity may be related to the body position at any stage of the act. It may be noticed that after the legs were piked and the body was in its backswing that the forceful straightening of the body was timed so that it occurred just before the center of gravity came beneath the horizontal bar (T). In this case the force was sufficient and the timing proper to raise the center of gravity from (T) to (B) and finally to (R), the body making a three-quarter revolution around the bar during this act. In the middle illustration another subject almost fails because of delaying the straightening-thrust too long. It may be observed that the body has actually passed beneath the bar before the center of gravity starts its major rise upward. In the lower illustration, the subject failed. The reasons for failure may be seen to be portrayed in the trajectory of the center of gravity. At the time of piking the legs (position P), the movement lacks definiteness and, failing to hold the legs in the pike position, they drooped downward causing a marked lowering of the center of gravity to (L). The straightening-thrust was also delayed much too long (T),

Ill. IV. Analysis of the Up-Start.



so that although the movement lifted the center of gravity fairly high, it was not high enough, nor was it possible to pull the body in over the bar by arm strength. The subject, therefore, fell downward to (B). Data collected from these films have made the basis of some important principles of teaching the up-start.

Lanoue [29] made an unusual study of diving, using films taken by the writer at the Olympic Games, Los Angeles, 1932. Illustration V shows Richard Degener executing a gainer 1½ somersault. The camera was placed opposite a point about three feet in front of the end of the board and sighted at an elevation about five feet above the board. The camera was locked on a tripod so as to take in the field without shifting the position of the camera.


GAINER 1½ SOMER.
(B)
DEGREE OF DIFFICULTY
Standing
Running
Layout
Pike
Tuck
COMMON FAULTS
1. Going out too far.
2. Too early an opening.
3. Going into pike early.
4. Loose pike.
5. Poor entry
6. Bringing arms down at start.
ESSENTIALS
1. Arms stretching back on takeoff.
2. Head and arms held back while legs are brought up.
3. Arms at sides in pike.
4. Open just past first somersault.
5. Knees and ankles locked.
COACHING SUGGESTIONS
1. Dive starts same as a dutchman the the back push is emphasized more.
2. Head thrown back throughout dive
3. Pike gainer necessary preliminary.
3. Hands placed on outside middle of thighs with fingers under.
4. Arm swing or thrust equally good on opening.
6. Arms back and head forward on entry.

ILL. V. Analysis of Diving.

By studying the Olympic Divers of 1932 Lanoue was able to come to the following conclusions:

Average Hurdle Height (distance above board) 29 inches
Average Hurdle Length .....33.2 inches
Average Height of Dives (c. of g. above board) .....76.6 inches
Average Dive Length (from end of board to vertical at point of entry).....80.5 inches
Average Take-off Angle (from horizontal)...74 degrees
Average Angle of Entry (from horizontal)...80 degrees

Lanoue demonstrated that he could predict the height or distance of a dive from measurements made from the film just as the diver left the board. These studies contributed interesting facts about timing of dives. The photographs permitted an analysis of the principles governing rotation and twisting in dives.

Popular reproductions may be made directly from the 35 mm. film by printing the negative film. Examples of this application are available in the Chicago Park District study of Al Greene,[3] and in the diving illustrations used in the new Red Cross text on "Swimming and Diving."[2]

## ANALYSIS OF THE GIANT SWING (FORWARD)

A final application may be made to the analysis of the giant swing. The subject used weighed 160 pounds, was 5′ 9″ tall, and from hand grasp on the bar to the toes measured 79″. Illustration VI shows a tracing made of a slow motion film of the act. A falling ball dropped 79″ required 280 clicks in the projector, or one click was equivalent to .00232 seconds.

TABLE I

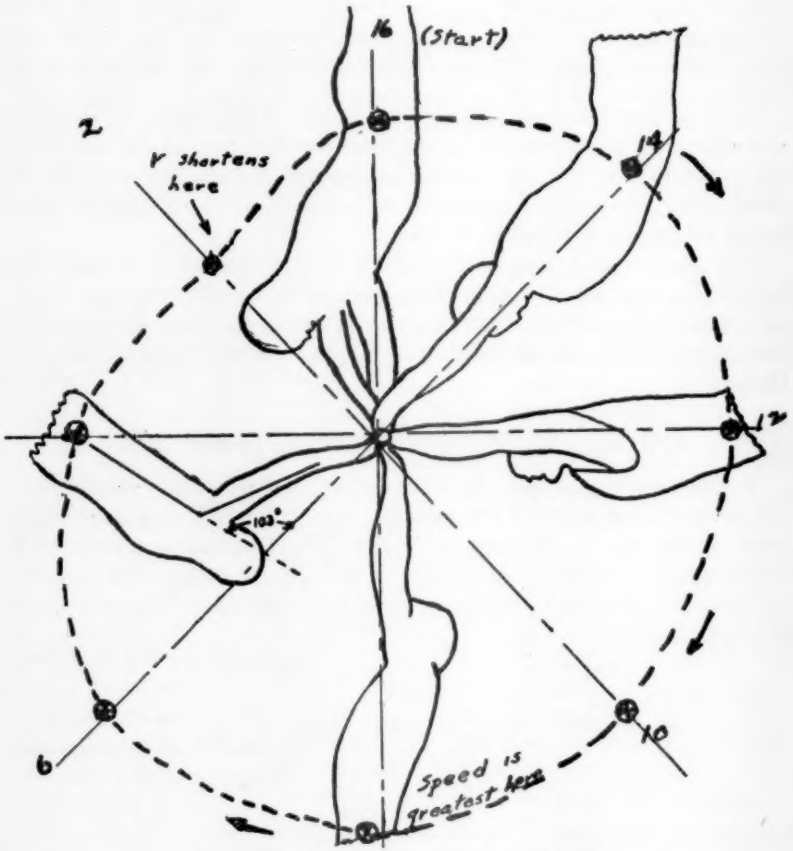
DATA ON GIANT SWING

| Positions in Giant Swing | Description of Positions in Giant | Distance c. of g. to Bar (ft.) | Traveled by c. of g. from Position Numbered to Next | Time (sec.) | V (ft./sec.) | $F_c$ (lbs.) |
|---|---|---|---|---|---|---|
| 16 | Top (start) | 3.49 | 5.80 | .629 | 9.22 | 121.2 |
| 14 | Top right | 4.15 | 5.69 | .644 | 8.84 | 93.2 |
| 12 | Right | 4.00 | 5.75 | .329 | 17.5 | 379.7 |
| 10 | Lower right | 4.15 | 6.56 | .255 | 25.7 | 789.3 |
| 8 | Bottom | 4.51 | 6.46 | .313 | 21.3 | 498.9 |
| 6 | Lower left | 4.46 | 6.10 | .369 | 16.5 | 302.7 |
| 4 | Left | 3.33 | 5.44 | .376 | 14.4 | 308.8 |
| 2 | Upper left | 2.72 | 5.18 | .378 | 13.7 | 341.3 |

The centrifugal force due to the rotational velocity was computed from the formula:

$F_c = \frac{W}{g}\frac{V^2}{r}$ wherein

$W$ = Weight of subject in lbs.
$g$ = 32.2 ft./sec.$^2$
$V^2$ = velocity (ft./sec.)$^2$
$r$ = Distance in feet from c. of g. to bar.




ILL. VI. Analysis of the Giant Swing

By stop watch, the average time required for the top half of the rotation was .95 seconds, the lower half .60 seconds. From the moving picture film the four quadrants required: top (.629), right (.329), bottom (.313), left (.376). The stop watch total time is 1.55 seconds compared to 1.647 seconds from the film. This gives a rough check on the reasonableness of the results.

From the above it may be observed that the greatest speed of rota-

tion is obtained in the position 10 toward the bottom. The critical phase is at position 2 where the body rocks up and over on the shoulder joint. This has the effect of moving the c. of g. toward the bar, decreasing r, this, in turn, increasing the velocity of rotation, thus aiding the body to assume the starting position again. It may be noticed that in position 10 there is developed 789.3 lbs. of centrifugal force, or tendency to pull away from the bar. It shows why the hands must be strong to do this event. Part of the body weight must be added to the centrifugal force equivalent to the component acting at position 10. This is sufficient to illustrate the possibility of studying events of this type in detail.

## AVOIDING ERRORS OF MEASUREMENT

Everyone has seen examples of photographic distortion, such as persons with feet larger than the body, buildings with unnaturally curved edges or narrowing sharply toward the top, owing to the fact that the camera was pointed upward, thus causing a perspective error. In a famous argument between two German authorities, Dr. Erich Kling [26] called attention to several fallacies upon which the conclusions of Dr. Waitzer were based, owing to photographic errors in the film data on track running. Neblette [38] gives a fine summary of such photographic errors. A few of the more common ones will be briefly mentioned together with a few suggestions for elimination or correction.

*Perspective Errors.*—The cause of the perspective error is fundamentally that of some part of the object being photographed being closer to the lens than some other part in the same visual field. The part relatively close appears large compared to the part farther away. This is a common illusion which everyone has probably noticed, for instance, when looking down a railroad track. The rails appear to come together in the distance. The size of the image is related to the distance of projection, and the size of the picture on the film is related to the distance at which it was taken by the following law:

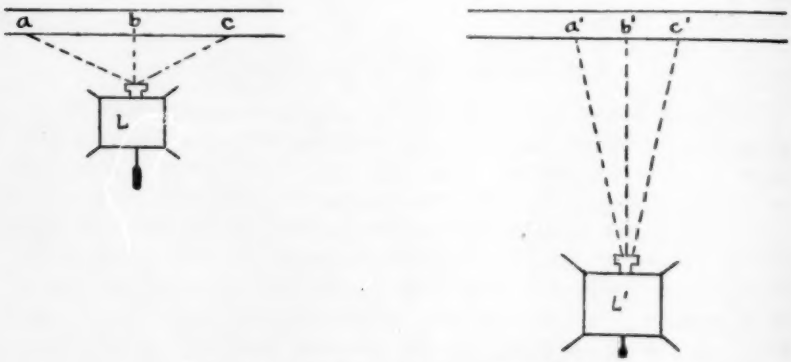
$$\frac{\text{Distance of Object to Lens}}{\text{Size of Object}} = \frac{\text{Distance of Image to Lens}}{\text{Size of Image on Film Plate}}$$

The errors of measurement are almost negligible in routine work on stable objects. This may be indicated in the following table which resulted from a check made on the accuracy with which body measurements could be reproduced by moving picture photography.

Perspective errors are greatly magnified when the camera is very close to the object. A possible means of minimizing this error is to use a telephoto lens and place the camera farther away. In photographing runners, for instance, Fenn[18] used this method and had the runners run behind a white lattice work, the dimensions of which were carefully

determined, and by locating the camera some distance away and using a telephoto lens for clarity, good pictures were obtained with a minimum of perspective error. The pictures were taken in a narrow zone directly in front of the lens with the runners running perpendicularly across the line of sight of the camera.

Illustration VII shows this relation. The objects a, b, and c are not at equal distances from the camera lens. Measurements on *a* will not be comparable with those on *b*. These differences are minimized in the arrangement shown in a′, b′, and c′.




ILL. VII. Reduction of Perspective Error.

It may be noted in Illustration VII that the distance *aL* is greater than the distance *bL*. When the camera is moved back, the difference in the lengths *a′L′* and *b′L′* is very slight. Hence, the perspective error is reduced. The fundamental rule is that the object to be photographed should be directly in front of the lens and aligned in a plane perpendicularly to the lens, either horizontally or vertically. Pictures taken from underwater on an upward slanting angle will be distorted. The parts nearer the camera will appear to be nearer and deeper in the water than the parts further away. Such errors may be noted in some of the underwater photography of swimmers. Most films of diving taken by spectators are useless for analytical purposes because the camera is very seldom aligned perpendicularly to the line of parabolic flight of the dive.

*Lens Aberrations.*—The causes of slight errors due to irregularities in the shape or quality of the lens or to the regulation of the light pencils passing through the lens include the following:

*a*) Astigmatic Distortion—Due to uneven curvature of the lens which results in irregularities of refraction of the light rays.

*b*) Chromatic Aberration—Due to the dispersing properties of glass and affected by quality of glass; this is illustrated by the spectrum

phenomena. The primary cause is the passage of the rays through the peripheral edges of the lens, these acting as prisms in distorting and dispersing the light rays.

*c*) Spherical Aberration—Due to unequal refraction of the light rays, particularly noticeable when the rays pass through the peripheral borders of the lens. Corrected by using a smaller diaphragm opening and better light for the pictures.

While the above types of errors are of consequence in the selection of lenses, and in the study of the physical phenomena of refraction, they represent minor problems which in all but a very few instances may be neglected.

Slight errors due to minor irregularities in the perfection of the lens are ignored in this article. Since most of the modern equipment is good, errors of astigmatic distortion, chromatic aberration, and spherical aberration are so negligible that they may usually be ignored in routine work.

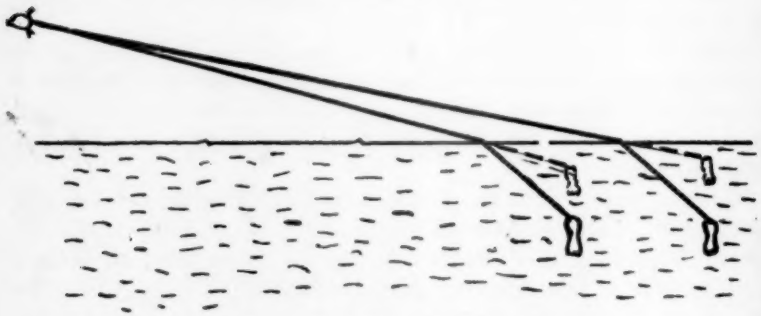
However, when objects are photographed through glass plate, or with camera above water and the object beneath, the possibility of error is great. This may be exemplified in pictures taken from underwater vats in pools or at Silver Springs, Florida. Not only are the perspective errors great, due to the nearness of the swimmers to the lens, but turning the camera away from a perpendicular shot through the glass vat causes distortion.

*Water Refraction.*—The fact should be recognized that objects photographed under water will appear closer to the surface than they really are when they are viewed from above the surface. The light rays are bent toward the normal when passing into a more dense medium, and they are bent away from the normal when passing from a more dense to a less dense medium (Ill. VIII). Light rays coming from an object under water are bent. The observer views the object as if the ray or line of sight were a straight line. In fact, the real object is lower than the apparent object.

The marked activity in underwater photography of swimming and lifesaving at this time suggests care in photographing and interpreting pictures which are supposed to be scientific exhibits. Photographs taken of breast strokers from the side often show one leg lower than the other. This is particularly true when the camera is close to the subject. Correction involves getting the camera directly above the subject or in line with the direction of body motion.

A photograph of Tsuruta, champion Japanese breast stroker, taken from above water and from one side of the pool, shows a distinct scissor-kick action in violation of the rules. This photograph could not be legitimately used to prove the point because of both perspective and refraction errors.

*Linear Distortion.*—The causes of linear distortion wherein straight lines are not reproduced as such are: curvature of the film or plate field, referring to the focal points of oblique and axial pencils forming on a curve rather than on a flat plane within the camera. This error may be caused by buckling of the film or plate within the camera or projector. In some of the cheaper projectors the film is not held flat within the film track and this causes distortion of the projected image. This may be checked by photographs of strings suspending weights, in other words, photographing a gravity line.



ILL. VIII. Error of Refraction.

*Errors of Scaling.*—Students will vary considerably in their ability to scale pictures accurately. Practice is necessary to get accurate results. Sharp outlines in the negative or projected image are very helpful. The basic problem is securing well-timed and sharp-edged images in the photography. Only experience in camera operation can produce this. Skill and suitable conditions are essential.

*Enlargements.*—Good enlargements may be made from 16 mm. film by means of the enlarging attachment made to fit any Filmo projector. This device consists of a tapered box at the small end of which a special fixed-focus enlarging lens is mounted. The regular projection lens is removed and the enlarger is slipped on to the projector in such a way that the enlarging lens replaces the regular lens. A bayonet-like shaft on the enlarger comes into firm contact with the projector aperture plate and automatically focuses the enlarging lens. A set screw locks the entire unit firmly into place.

A film pack adapter, supplied with the enlarger, is loaded with a pack and slipped into place at the large end of the tapered box. The hinged cover at the top of the box is then raised so that the film may be viewed as it is projected upon the white surface of the film pack adapter slide.

When a scene from which an enlargement is desired appears upon the screen, the projector clutch is disengaged, the enlarger shutter

closed, the pack adapter slide removed, and the picture is projected just as one would project a single frame upon a screen. Then the enlarger shutter is pressed, giving an instantaneous exposure and producing a properly-timed negative from any correctly exposed frame of negative or positive film.

In this way serial reproductions may be made of selected frames in the film. It may be desired to reproduce every tenth frame in even increments of time advancement, or to reproduce the frame corresponding to every half second, or to select key positions in the form.

*Location of the Center of Gravity.*—Since in all of the physical equations the body may be treated as a mass concentrated at a single point called the Center of Gravity, research workers should know how to locate this point. It moves within a limited range with the movements of the limbs and the bending of the trunk. Amar[1] reviews some of the work on the center of gravity but this is not specifically related to film measurements. Cureton and Wickens [13] have experimented extensively with this problem at Springfield College. Fenn [17] treats this also in rather recent study. In the studies carried out by Lanoue [29] and Harris [21] subjects were suspended in various positions and the intersections of the gravity lines locate the center of gravity in one plane. The center of gravity postural apparatus has helped determine some of the changes. In the vertical standing position the center of gravity is located approximately in the center of the waist on a level with the umbilicus. It lies within what is called the "belt line." However, lifting the arms overhead raises the center of gravity about two centimeters. A lift of the leg forward as in track running moves the center of gravity forward and upward. Fenn has shown that its range of movement may be as great as 11 cm. Good work in analyzing films requires ability to estimate changes in the center of gravity quite closely. While the center of gravity may be computed for any body segment in any position, this is tedious and time-consuming work and usually not worth while.

TABLE II

PHOTOGRAPHIC AND MEASUREMENT ERROR

| Item Measured | Multiplier | Projected Image Measurement (cm) | Corrected to Life Size (cm) | Actual Measurement of Subject | Deviation (cm) | Per Cent Error |
|---|---|---|---|---|---|---|
| Height ..... | 14.78 | 11.7 | 173.00 | 173.0 | 0 | 0 |
| Shoulder Width. | 14.78 | 2.9 | 42.86 | 43.0 | .14 | .33 |
| Head Width ... | 14.78 | .9 | 13.30 | 12.1 | 1.20 | 9.94 |
| Hip Width .... | 14.78 | 1.8 | 26.60 | 26.3 | .30 | 1.14 |

$$\text{Standard Error} = \sqrt{\frac{\Sigma d^2}{N}} = .624 \text{ cm.}$$

Such measurements of length or width are usually quite accurate if the pictures are clearly defined and the film is projected and traced with reasonable care. If the projector is a very cheap one, the film may buckle and a straight line may not photograph as such. If the work is to be precise, it will pay to check this type of error. A tight gravity line may be photographed as a test. Tapley,[45] McGregor-Robertson,[42] and Neblette [28] are good sources for the theory of such errors.

Attention should be called to two very early advocates of photography in anthropometry and athletics: Seerley[43] and Phillips[41] were stressing this approach in 1894.

## CONCLUSION

Analytical work on films promises to contribute much to technical knowledge of athletic action. Intensive work of this type is just now beginning to be reported at an accelerated rate. The facts derived by the painfully slow process will accumulate to make possible much more scientific views of the principles employed in athletic performances. Such knowledge should contribute greatly to the improved manuals of pedagogy.

## BIBLIOGRAPHY

1. Amar, Jules, *The Human Motor*, 334-58, (London: Routlege, 1920) 470; translated by E. P. Butterworth and G. E. Wright (American edition published by E. P. Dutton and Co.).
2. American Red Cross, *Swimming and Diving*, 178-266, (Philadelphia: P. Blakiston's Son and Co., Inc., 1938) 271.
3. Chicago Park District, *Diving*, Modern Recreation Series, Burnham Park, Chicago, 1937. 96.
4. *Consumers' Digest*, "Motion Picture Cameras and Equipment," 3:18-27, March, 1938. (Condensed from *Consumers' Research Bulletin*, November, 1937.)
5. Cureton, Thomas K., Jr., *Physics Applied to Health and Physical Education*, privately published laboratory manual, 1933.
6. Cureton, Thomas K., Jr., "Mechanics and Kinesiology of the Crawl Flutter Kick," RESEARCH QUARTERLY, 1:93-96, December, 1930. (Underwater cinematographical analysis of Weismuller's flutter kick.)
7. Cureton, Thomas K., Jr., "An Analysis of the Errors of Stop Watch Timing," RESEARCH QUARTERLY, 4:94-109, May, 1933.
8. Cureton, Thomas K., Jr., "Mechanics of the Track Racing Start," *Scholastic Coach*, 4:14-15, January, 1935.
9. Cureton, Thomas K., Jr., "Mechanics of Track Running," *Scholastic Coach*, 4:7-10, February, 1935.
10. Cureton, Thomas K., Jr., "Mechanics of the Shot Put," *Scholastic Coach*, 4:7-10, March, 1935.
11. Cureton, Thomas K., Jr., "Mechanics of the High Jump," *Scholastic Coach*, 4:9-12, April, 1935.
12. Cureton, Thomas K., Jr., "Mechanics of the Broad Jump," *Scholastic Coach*, 4:8-9, May, 1935.
13. Cureton, T. K. and Wickens, J. S., "The Center of Gravity of the Human Body in the Antero-Posterior Plane and Its Relation to Posture, Physical Fitness and Athletic Ability," SUPPLEMENT TO THE RESEARCH QUARTERLY, 6: 93-105, May, 1935.

14. Demeny, Georges, "Les Bases Scientifique de L'Education Physique," 295-297, (Paris: Felix Alcan, 1903).
15. "Enlargements from Amateur Movies," *Scientific American*, 68-69, July, 1929.
16. Fenn, Wallace O., "Frictional and Kinetic Factors in the Work of Sprint Running," *American Journal of Physiology*, 92:583-611, April, 1930.
17. Fenn, Wallace O., "Work Against Gravity and Work Due to Velocity Changes in Running," *American Journal of Physiology*, 93:433-462, June, 1930.
18. Fenn, Wallace O., "A Cinematographic Study of Sprinters," *The Scientific Monthly*, 32:346-354, April, 1931.
19. Footrick, William, *An Analysis of Javelin Throwing*, (Springfield, Mass.: Springfield College, master's thesis, 1938) 99.
20. Glassow, Ruth B., and Broer, Marion R., "A Convenient Apparatus for the Study of Motion Picture Films," THE RESEARCH QUARTERLY, 9:41-49, May, 1938.
21. Harris, Ralph C., "A Mechanical Analysis of the Up-start on the High Bar," (Springfield, Mass.: Springfield College, unpublished project, Department of Applied Physics and Body Mechanics, 1934) 50.
22. Heidloff, R. C., "A Logical Application of Physics to Selected Tumbling Stunts," (Springfield, Mass.: Springfield College, master's thesis, 1938) 103+.
23. Huff, Myron R., "Electrically Operated Timer and High Speed Camera So Closely Coordinated that They Take the Apparent Out of Sports and Record the Actual," (feature article, Springfield Sunday Union and Republican, Springfield, Mass.: May 7, 1933)
24. Hughes, W. L. and Stimson, Pauline, "Motion Pictures in Health and Physical Education," RESEARCH QUARTERLY, 9:104-153, March, 1938.
25. Kjellstrom, Louise, (3200-16th St., N. W., Washington, D. C.), "Report of the Motion Picture Committee," mimeographed report, 1938.
26. Kling, Erich, "Und doch Ballenlauf," *Die Leibesubungen*, 3:61-67, February, 1925.
27. Knight, W. and Hepp, F., "Mechanical Analysis of the Track Racing Start," (Springfield, Mass.: Springfield College, Unpublished project, Dept. of Applied Physics and Body Mechanics, 1935) 50.
28. Kohlrausch, E., "Physik des Turnens," Lion, 1887. (Contained in the Harvard library.)
29. Lanoue, F. R., *Mechanics of Fancy Diving*, (Springfield Mass.: Springfield College, master's thesis, 1936) 67.
30. LaPorte, William R., "Public School Physical Education Films," (Los Angeles: Visual Text Sales Co., pamphlet) 4.
31. Marey, E. J., *La Photographie du Mouvement*, (Paris: Carré, 1892) 97.
32. McKay, H. C., *The Handbook of Motion Picture Photography*, (New York: Falk Publishing Co., 1927) 293.
33. McKay, H. C., *Motion Picture Photography*, (New York: Falk Publishing Co., Inc., 1927) 7-18.
34. Memery, H. N. and Cornell, D. D., "An Analysis of Propelling Force and Kinetic Energy Involved in the Shot Put," (Springfield, Mass.: Springfield College, unpublished project, Department of Applied Physics and Body Mechanics, 1935) 23.
35. Muybridge, Eadweard, *Animal Locomotion* (Philadelphia: Photo-Gravure Co., 1887) 781 Pl. (One of 37 copies extant.)
36. Muybridge, Eadweard, *Animals in Motion*, (London: Chapman and Hall, Ltd., 1925) 264.
37. Muybridge, Eadweard, *Descriptive Zoopraxography*, (Philadelphia: University of Pennsylvania, 1893).
38. Neblette, C. B., *Photography, Principles and Practice*, 65-104, (New York: D. Van Nostrand Co., Inc., 1930) 600.

39. Nitzsche, George E., "The Muybridge Moving Picture Experiments at the University of Pennsylvania," *General Magazine,* Burlington, N. J., 31:323-332, 1929.
40. Parry, Kenneth R., *Learning Process in Tumbling for the Elementary Grades,* (Springfield, Mass.: Springfield College, master's thesis, 1933) 91.
41. Phillips, Paul C., "Photography in Anthropometry," *Proceedings of the American Association for the Advancement of Physical Education,* 17-25, 1894.
42. Robertson, J. M'Gregor, *Elements of Physiological Physics,* 300-346, (Philadelphia: Lea, 1884) 528.
43. Seerley, F. N., "Relation of Photography to Athletics," *Proceedings of the American Association for the Advancement of Physical Education,* 26, 1894.
44. Stillman, Jacob D. B., *The Horse in Motion,* (Boston: J. R. Osgood and Co., 1882).
45. Tapley, D. J., *Amateur Photography,* 120-137, (New York: Green, 1884) 142.
46. "The Ultra Rapid Cinematograph," *Scientific American Supplement,* 310, Nov. 12, 1910; 374, Dec. 10, 1910.
47. "The Kinematographic Study of Runners and Jumpers," *Die Leibesübungen,* 85-92, Feb. 20, 1930.
48. Wickens, J. S., *The Center of Gravity of the Human Body in the Antero-Posterior Plane and Its Relation to Posture,* (Springfield, Mass.: Springfield College, master's thesis, 1934).
49. Wickens, J. S., *Comparison of Various Methods of Determining the Center of Gravity,* (Springfield, Mass.: Springfield College, unpublished project, Department of Applied Physics and Body Mechanics, 1932).

# A Bibliography of Textbooks in Health Education for the Elementary and High Schools

By H. F. KILANDER, PH.D.
*Dean and Professor of Health Education*
*Panzer College of Physical Education and Hygiene*
*East Orange, New Jersey*

HEALTH education has not attained a place in the school curriculum comparable to that of other subjects, although it is admitted that health should have a foremost place in education. There are several reasons for this situation as it relates to health instruction, such as insufficient time and facilities, poor coordination and sequence of subject matter, and lack of suitable teaching material—textbooks, for instance.

In recent years, especially in the last five years, many excellent textbooks in health education have been published for the elementary and high school levels. This increase undoubtedly indicates a greater interest in health education and augurs better days for this field of education. It is admitted that there are many values in methods of health instruction which do not require the use of a textbook. Yet teaching procedure which makes textbooks available for the entire class will be more effective, more thorough, less wasteful of time, and consequently more interesting—at least in the higher grades.

The following bibliography includes the health education textbooks published in recent years.* Many of these books are arranged in series, and are intended for a number of consecutive years. Thirty different publishers are in the field to date. For certain practical reasons of grouping, the books are arranged by publishers rather than by authors and titles. The books include those published up to April, 1939. Safety education textbooks have been listed with the health education books because they frequently are part of a series.

The authors or the publishers have indicated the grade placement in most instances. Where this information is lacking, the writer has attempted to determine the grade or grades for which the book seems appropriate. In schools where health instruction has not been given in preceding classes, it may be found that a textbook indicated as being suitable for a certain grade may be too difficult or too advanced. The reverse situation may also occur in instances where a thorough in-

* Acknowledgement is here given to Mr. Raymond L. Hopkins, Instructor in Physical Education, Woodrow Wilson High School, Weehawken, New Jersey, for valuable assistance in connection with the bibliography.

## Check-List for Textbooks in Health Education

Title of book or series.....

Author..... Publisher.....

Date published ..... Reviewed by.....

| | Score | | | | | |
|---|---|---|---|---|---|---|
| Names of books | | | | | | |
| Grade for which intended | | | | | | |
| Length | | | | | | |
| Cost | | | | | | |
| 1. Physical Characteristics | | | | | | |
| A. Attractive appearance | 2 | | | | | |
| B. Cover and binding strong | 2 | | | | | |
| C. Print of desirable size | 2 | | | | | |
| D. Book of handy size | 2 | | | | | |
| E. Paper of good quality | 2 | | | | | |
| Total | 10 | | | | | |
| 2. Subject-Matter Content | | | | | | |
| A. Topics appropriate for grade level | 15 | | | | | |
| B. Attitudes and habits as well as facts are stressed | 7 | | | | | |
| C. Practical subject matter which leads to correct habit formation | 6 | | | | | |
| D. Situations within experience of pupil. | 6 | | | | | |
| E. Style satisfactory for age | 5 | | | | | |
| F. Vocabulary satisfactory for age | 5 | | | | | |
| G. Illustrations varied, clear, and to the point | 6 | | | | | |
| Total | 50 | | | | | |
| 3. Aids for Use of Textbook | | | | | | |
| A. When desirable, it has a good index, table of contents, glossary, etc. | 10 | | | | | |
| B. Has good questions which: | | | | | | |
| a) Cover the topic | 2 | | | | | |
| b) Are challenging | 2 | | | | | |
| c) Require thinking | 3 | | | | | |
| d) Relate to habits and attitudes as well as facts | 4 | | | | | |
| C. Headings are challenging | 3 | | | | | |
| D. Has interesting student activities (projects) suggested | 6 | | | | | |
| Total | 30 | | | | | |
| 4. Miscellaneous | | | | | | |
| A. Authors are experienced and able | 3 | | | | | |
| B. Published sufficiently recently | 3 | | | | | |
| C. Material scientifically accurate | 4 | | | | | |
| Total | 10 | | | | | |
| Grand Total for Book | 100 | | | | | |

struction has been given in previous grades. In general, however, the grade placement listed is appropriate.

The Check List for Textbooks in Health Education is used by the writer in his classes in Methods of Teaching Health Education. The total score for a given book may be of value in comparison with that of another book. However, the total score as evaluated on the basis of this check list is not the essential point in its use. Rather, the check list is useful in directing the reviewer to the many factors which need to be considered. It is a reminder list. A textbook for the lower grades in a given series may lack certain of the teaching aids which may be present in books for the higher grades, or the opposite may be the case; yet, each may be pedagogically correct for the grade for which it is intended.

The values given to the various items have been assigned on the assumption that the more recently published books are being examined. Most of these books agree on certain points and so the maximum value allocated to such items has been kept low. Greater value has been given to those items which are more likely to differ or be missing in some books. This arrangement permits a wider spread in the scoring.

In selecting a single textbook or a series of textbooks in health education, consideration should be given to the following points, in addition to what has already been mentioned:

1. The amount of health education that the pupils have had prior to the grade for which the textbooks are being purchased.

2. The amount of time which will be available for the teaching of the contents in the books which eventually will be adopted.

3. The amount of additional teaching which these same pupils will receive in the classes which follow those for which the books under consideration are to be used.

4. It is not recommended that books from several series be combined in a school. Poor sequence and overlapping may result.

5. Special thought needs to be exercised in the choice of a series of books in a situation where all the students in several grades will be taking the same course and using the same book.

## BIBLIOGRAPHY OF TEXTBOOKS IN HEALTH AND SAFETY EDUCATION FOR ELEMENTARY AND HIGH SCHOOLS


| | *Grades* |
|---|---|
| ALLYN AND BACON COMPANY, Boston, Massachusetts | |
| Health Workbook. Riley, Philip L., Merritt A. Wight, and Wm. L. Conner. 1935. 151 pages. $.45 | 7–10 |
| The Science of Everyday Health. Blount, Ralph E. 1936. 415 pages. $.90 | Sr.H.S. |
| Workbook in Health to accompany Blount's Science of Everyday Health. Blount, Ralph E. 1938. 184 pages. $.45 | |
| AMERICAN BOOK COMPANY, 86 Lexington Avenue, New York City | |
| Everyday Problems in Health. Wheat, Frank M., and Elizabeth T. Fitzpatrick. 1935. 456 pages. $1.20 | Sr.H.S. |

| | *Grades* |
|---|---|
| Practical Problems in Home Life. Talbot, N. A., F. L. Lytle, M. V. Pearson, and A. M. Johnson. 1936. 515 pages. $1.32 | Jr.&Sr. H.S. |
| Health and Happiness Series. Newmayer, S. W., and E. C. Broome. | |
| Book I Health in Good-Habit Land. 1934. 155 pages. $.64 | 3 |
| Book II Pathways in Healthland. 1934. 222 pages. .72 | 4 |
| Book III Highroads to Health. 1934. 326 pages. .84 | 5–6 |
| Book IV Health and the Human Body. 1935. 398 pages. .96 | 7–8 |
| Our Ways of Living. Wilson, H. E., F. H. Wilson, and B. P. Erb. | |
| Book I Ways of Living in Many Lands. 1937. 305 pages. $1.16 | 3 |
| Book II Where Our Ways of Living Come From. 1937. 474 pages. 1.28 | 4 |
| Book III Living in the Age of Machines. 1937. 586 pages. 1.48 | 5 |
| Book IV Richer Ways of Living. 1937. 666 pages. 1.52 | 6 |
| The Road to Safety. Buckley, H. M., M. L. White, A. B. Adams, and L. R. Silvernale. | |
| A. Away We Go. 1938. 56 pages. $.20 | 1 |
| B. Happy Times. 1938. 137 pages. .56 | 2 |
| C. In Storm and Sunshine. 1938. 152 pages. .64 | 3 |
| D. In Town and Country. 1938. 216 pages. .72 | 4 |
| E. Here and There. 1938. 285 pages. .72 | 5 |
| F. Around the Year. 1938. 346 pages. .76 | 6 |
| G. On Land and Water. 1938. 357 pages. .80 | 7 |
| H. Who Travels There. 1938. 440 pages. .88 | 8 |
| Safety for Myself and Others (workbook). Bush, G. L., T. W. Ptacek, and John Kovats, Jr. 1937. 251 pages. $.44 | Sr.H.S. |
| D. Appleton–Century Company, Inc., 35 W. 32nd St., New York City | |
| Sense and Safety on the Road. Stoeckel, R. B., M. A. May, and S. R. Kirby. 1936. 293 pages. $1.75 | Sr.H.S. |
| A. S. Barnes and Company, 67 West 44th Street, New York City | |
| A Workbook in Health for High School Girls. Gogle, Gladys. 1937. 264 pages. $1.00 | Sr.H.S. |
| Real Living. Workbooks for boys. Allen, Ross L. | |
| Book I. 1939. 106 pages. $.50 | Jr.H.S. |
| Book II. 1939. 68 pages. .50 | Sr.H.S. |
| Glenn H. Berry, 9004 Rosewood Avenue, Los Angeles, California | |
| Healthful Living. Berry, Glenn H. | |
| Cycle 1, Part 1 Personal Hygiene. 1937. 71 pages. $1.50 | |
| Cycle 1, Part 2 Food and Nutrition. 1937. 71 pages. 1.50 | H.S. |
| Cycle 2, Part 1 Community Hygiene. 1937. 65 pages. 1.50 | All |
| Cycle 2, Part 2 First Aid. 1937. 70 pages. 1.50 | Jr.&Sr. |
| Cycle 3, Part 1 Mental Hygiene. 1937. 71 pages. 1.50 | |
| Cycle 3, Part 2 Social Hygiene. 1937. 82 pages. 1.50 | |
| P. Blakiston's Son and Co., Inc., 1012 Walnut Street, Philadelphia, Pa. | |
| The Health of Youth. Meredith, Florence. 1928. 250 pages. $1.60 | Sr.H.S. |
| Twelve Hours of Hygiene. Meredith, F. L. 1935. 385 pages. $1.90 | Sr.H.S. |
| Text Book of the American Red Cross. 1933. 230 pages. Paper $.60, Cloth $1.00 | Jr.&Sr. H.S. |
| American Red Cross Text Book on Home Hygiene and Care of the Sick. Delano, Jane A. 1933. 390 pages. Paper $.75, Cloth $1.40 | H.S. |
| Bobbs–Merrill Company, 468 Fourth Avenue, New York City | |
| Habits for Right Living Series. Emerson, C. P. and G. H. Betts. | |
| Habits for Health. 1936. 247 pages. $.72 | 6–10 |
| Living at Our Best. 1936. 328 pages. .84 | 6–10 |
| Public Safety. Kreml, F. M., D. F. Stiver, and T. B. Rice. 1937. 310 pages. $1.12. (To teachers and to schools, $.84) | Jr.&Sr. H.S. |

| | | Grades |
|---|---|---|
| **GINN AND COMPANY, 70 Fifth Avenue, New York City** | | |
| Story Series in Health. Andress, J. M., and I. H. Goldberger. | | |
| Summer Fun. | 1932. 138 pages. $.64 | 1 |
| Sunshine School. | 1928. 188 pages. .72 | 2 |
| A Journey to Health Land. | 1924. 194 pages. .72 | 3 |
| Boys and Girls of Wake-Up Town. | 1924. 218 pages. .76 | 4 |
| The Health School on Wheels. | 1933. 399 pages. .80 | 5 |
| Broadcasting Health. | 1933. 401 pages. .80 | 6 |
| Health and Success. Andress, James Mace. 1933. 268 pages. $.68 | | Jr.H.S. |
| Health and Good Citizenship. Andress, James Mace. 1933. 391 pages. $.88 | | Jr.H.S. |
| Science and the Way to Health. Andress, J. M., and M. A. Brown. 1929. 368 pages. $1.00 | | Sr.H.S. |
| Health Essentials. Andress, J. M., A. K. Aldinger, and I. H. Goldberger. 1928. 495 pages. $1.60 | | Sr.H.S. |
| Health and Achievement. Cockefair, E. A., and A. M. Cockefair. 1936. 536 pages. $1.60 | | Sr.H.S. |
| Safe and Healthy Living Series. Andress, Goldberger, Dolch, & Halleck. | | |
| Spick and Span. | 1938. 142 pages. $.64 | 1 |
| The Health Parade. | 1939. 168 pages. .72 | 2 |
| Growing Big and Strong. | 1939. 237 pages. .76 | 3 |
| Safety Every Day. | 1939. 235 pages. .76 | 4 |
| Doing Your Best for Health. | 1939. 264 pages. .80 | 5 |
| Building Good Health. | 1939. 274 pages. .84 | 6 |
| Helping the Body in Its Work. | 1939. 284 pages. .84 | 7 |
| The Healthy Home and Community. | 1939. 298 pages. .88 | 8 |
| **GLOBE BOOK COMPANY, 175 Fifth Avenue, New York City** | | |
| Vocational Hygiene. Caplin, Daniel, and S. G. Ocean. 1938. 207 pages. $1.60 | | Sr.H.S. |
| Guarding Our Health. Olsson, Nils W. 1936. 155 pages. $1.00 | | Sr.H.S. |
| **HARPER AND BROTHERS, 49 East 33rd Street, New York City** | | |
| My Body and How It Works. Baruch, Dorothy and Oscar Reiss. 1934. 99 pages. $1.50 | | 6–9 |
| **D. C. HEATH AND COMPANY, 239 West 29th Street, New York City** | | |
| Practical Hygiene Series. Walters, Francis M. | | |
| Our Journey of Growth. | 1931. 251 pages. $.80 | 5 |
| Our Health Foundations. | 1931. 276 pages. .88 | 6 |
| Malden Health Series. Turner, Clair E. and others. | | |
| The Joy Family. | 1936. 130 pages. $.56 | 2 |
| The Voyage of Growing Up. | 1935. 204 pages. .60 | 3 |
| In Training for Health. | 1935. 152 pages. .60 | 4 |
| Health. | 1930. 232 pages. .72 | 5 |
| Cleanliness and Health. | 1932. 236 pages. .80 | 6 |
| Community Health. | 1935. 250 pages. .84 | 7–8 |
| Physiology and Health. | 1935. 278 pages. .96 | 8–9 |
| Home Nursing and Child Care. | 1930. 282 pages. 1.20 | 8–9 |
| Teacher's Manual—Grades I-VI. | .24 | |
| **HENRY HOLT AND COMPANY, 257 Fourth Avenue, New York City** | | |
| Human Health. Thackston, J. A., and J. F. Thackston. 1936. 459 pages. $1.40 | | 7–10 |
| The Human Body and Its Functions. Best, C. H., and N. B. Taylor. 1932. 350 pages. $3.25 | | 6–10 |
| Safety First—and Last. Dull, Charles E. 1938. 251 pages. $1.20 | | Sr.H.S. |

| | *Grades* |
|---|---|
| **HOUGHTON MIFFLIN COMPANY**, 386 Fourth Avenue, New York City | |
| Aleck and His Friends. Dearborn, Blanche J. 1932. 139 pages. $.80 | 2–3 |
| Foundations of Health. Rathbone, Josephine L., F. L. Bacon, and C. H. Keene. 1936. 410 pages. $1.44 | Sr.H.S. |
| **LAIDLAW PUBLISHING COMPANY**, 36 West 24th Street, New York City | |
| The Road to Health; Book I. 1932. 96 pages. $.52 | 1 |
| The Road to Health; Book II. 1932. 127 pages. .56 | 2 |
| Bundensen, Herman N., and Corrine Manry. | |
| **LEA AND FEBIGER**, 600 South Washington Square, Philadelphia, Pa. | |
| The Foundation of Health. Sharp, William B. 1930. 308 pages. $2.50 | Sr.H.S. |
| **J. B. LIPPINCOTT COMPANY**, Philadelphia, Pa. | |
| Be Healthy. Crisp, Katherine B. 1938. 532 pages. $1.56 | Sr.H.S. |
| **LYONS AND CARNAHAN**, 76 Ninth Avenue, New York City | |
| Health, Happiness, Success Series. Burkard, Chambers, and Maroney. | |
| Health Stories and Practice. 1931. 256 pages. $.76 | 3 |
| Health by Doing. 1936. 314 pages. .57 | 4 |
| Building for Health. 1936. 309 pages. .57 | 5 |
| The Body and Health. 1936. 313 pages. .57 | 6 |
| Personal and Public Health. 1936. 319 pages .57 | 7 |
| Personal and Public Health. 1936. 360 pages. .57 | 8 |
| Health and Human Welfare. Burkard, Chambers, and Maroney. 1931. 532 pages. $.57 | Jr.&Sr. H.S. |
| Safety; Your Problem and Mine. Evans, W. A., and M. B. Fry. 1938. 312 pages. $1.00 | Jr.&Sr. H.S. |
| **THE MACMILLAN COMPANY**, 60 Fifth Avenue, New York City | |
| From Morning Till Night. Charters, W. W., F. D. Smiley, and R. M. Strang. 1936. 152 pages. $.60 | 2 |
| Happy Days. Charters, W. W., D. F. Smiley, and R. M. Strang. 1936. 168 pages. $.60 | 2 |
| The Health and Growth Series. Charters, W. W., D. F. Smiley, and Ruth Strang. | |
| Good Habits. 1936. 185 pages. $.60 | 3 |
| Living Healthfully. 1936. 185 pages. .60 | 4 |
| Wise Health Choices. 1936. 212 pages. .72 | 5 |
| Health Problems. 1936. 231 pages. .80 | 6 |
| Adventures in Health. 1935. 227 pages. .80 | 7 |
| Health Knowledge. 1935. 255 pages. .80 | 8 |
| (Workbooks for each) | |
| Always Be Safe (workbook). McCracken, Mary Jo. 1938. 93 pages. $.48 | 1–4 |
| Living Safely (workbook). Bowman, Earl C. and P. F. Boston. 1938. 178 pages. $.52 | Jr.H.S. |
| **McGRAW-HILL BOOK COMPANY**, 330 West 42nd Street, New York City | |
| Safety Through the Year (workbook). Nelson, Florence, and H. L. Cottrell. 1937. 95 pages. $.52 | 8 |
| **CHARLES E. MERRILL COMPANY**, 381 Fourth Avenue, New York City | |
| The New Healthy Living Series. Winslow, C.-E.A., and M. L. Hahn. | |
| The Game of Healthy Living. 1934. 242 pages. $.64 | 5 |
| The Habits of Healthy Living. 1934. 228 pages. .64 | 6 |
| The Laws of Healthy Living. 1932. 255 pages. .64 | 7 |
| The Healthy Community. 1934. 288 pages. .68 | 8 |
| Let's Grow. Hahn, M. L., and C.-E. A. Winslow. 1938. 186 pages. $.72 | 3 |
| Let's Stay Well. Hahn, M. L., and C.-E. A. Winslow. 1938. 184 pages. $.72 | 4 |

| | *Grades* |
|---|---|
| Stories of Health and Happiness. Jenkins, E. B. and C.-E. A. Winslow. 1929. 163 pages. $.68 | 5 |
| The Land of Health. Hallock, G. T., C.-E. A. Winslow, and Walter Camp. 1922. 208 pages. $.72 | 6 |
| THOMAS NELSON AND SON, 381 Fourth Avenue, New York City | |
| Adventures in Living Series. Wood, Lerrigo, Lamkin, Rice, and Phelan. | |
| Now We Are Growing. 1936. 218 pages. $.60 | 3 |
| Many Ways of Living. 1936. 209 pages. .60 | 4 |
| Keeping Fit. 1936. 237 pages. .72 | 5 |
| Blazing the Trail. 1936. 248 pages. .80 | 6 |
| How We Live. 1936. 328 pages. .80 | 7–8 |
| New Ways for Old. 1938. 320 pages. .80 | 7–8 |
| Teacher's Handbook for Now We Are Growing and Many Ways of Living. 1937. 64 pages. | |
| Teacher's Handbook for Keeping Fit and Blazing the Trail. 1937. 64 pages. | |
| The Safe-Way Club. Bryce, Catherine. 1938. 107 pages. $1.50 | 4–6 |
| A. J. NYSTROM & COMPANY, 3333 Elston Avenue, Chicago, Ill. | |
| Right Things To Do for Health and Growth. | |
| Book One—Alexandroff, Cherrie P. 1938. 70 pages. $.45 | 1 |
| Book Two—Alexander, Hedwig, and C. P. Alexandroff. 1938. 70 pages. $.45 | 2 |
| Book Three—Alexander, Hedwig. 1938. 70 pages. $.45 | 3 |
| PRENTICE-HALL, INC., 70 Fifth Avenue, New York City | |
| Health Guides and Guards. Wall, Francis P., and L. D. Zeidberg, 1938. 380 pages. $1.40 | Sr.H.S. |
| RAND MCNALLY & COMPANY, 111 Eighth Avenue, New York City | |
| Health and Safety Series. Brownell, Ireland, and Siegl. | |
| Friendly Living. 1937. 186 pages. $.45 | 3 |
| Happy Living. 1937. 202 pages. .48 | 4 |
| Everyday Living. 1935. 218 pages. .51 | 5 |
| Helpful Living. 1935. 232 pages. .54 | 6 |
| Science in Living. 1935. 248 pages. .57 | 7 |
| Progress in Living. 1935. 260 pages. .60 | 8 |
| Adventures in Safety. (to be published) 1.25 | |
| BENJAMIN H. SANBORN COMPANY, 185 Madison Avenue, New York City | |
| Wholesome Living Series. Williams, J. F., and Theresa Dansdill. | |
| Health and Happiness. 1930. 106 pages. $.64 | 2 |
| Health and the Rules of the Game. 1935. 136 pages. .64 | 3 |
| Health and Control. 1935. 209 pages. .68 | 5 |
| Health and Service. 1935. 228 pages. .72 | 6 |
| Health and Ideals. 1935. 246 pages. .80 | 7–8 |
| Health and Growing-Up. Dansdill, Theresa. 1937. 127 pages. $.72 | 2–5 |
| W. B. SAUNDERS COMPANY, West Washington Square, Philadelphia, Pa. | |
| The Fundamentals of Personal Hygiene. Krueger, Walter S. 1936. 280 pages. $1.75 | Sr.H.S. |
| SCOTT, FORESMAN AND COMPANY, 114 East 23rd Street, New York City | |
| Curriculum Foundation Series, Life Reading Service. Towse, Anna B., Florence Matthews, and William S. Gray. | |
| Health Stories, Book I. 1933. 144 pages. $.60 | 1 |
| Health Stories, Book II. 1934. 176 pages. .68 | 2 |
| Health Stories, Book III. 1937. 208 pages. .76 | 3 |

| | | | | | *Grades* |
|---|---|---|---|---|---|
| **SILVER, BURDETT COMPANY**, 45 East 17th Street, New York City | | | | | |
| Health Horizons. Broadhurst, Jean, and M. O. Lerrigo. 1931. 516 pages. $3.00 | | | | | Elem.& H.S. |
| Health for Everyday. 1930. 235 pages. $.72. | | | | | Upper Elem. |
| Health in Home and Neighborhood. Bigelow, M. A., and Jean Broadhurst. 1930. 320 pages. $.84. | | | | | |
| **JOHN C. WINSTON**, 76 Ninth Avenue, New York City | | | | | |
| Healthy Life Series. Fowlkes, J. G., L. Z. Jackson, and A. S. Jackson. | | | | | |
| Healthy Bodies. | 1936. 216 pages. | $.64 | | | 3 |
| Healthy Growing. | 1936. 216 pages. | .64 | | | 4 |
| Keeping Well. | 1936. 264 pages. | .80 | | | 5 |
| Healthy Living. | 1936. 288 pages. | .84 | | | 6 |
| Success Through Health. | 1938. 351 pages. | .96 | | | 7 |
| Making Life Healthful. | 1938. 400 pages. | .96 | | | 8 |
| **WORLD BOOK COMPANY**, 313 Park Hill Avenue, Yonkers, N. Y. | | | | | |
| Health Studies (2 books). Gregg, F. M., and H. G. Rowell. 1 vol. ed. 1932. 568 pages. $1.20 | | | | | 7–10 |
| New World Health Series. Ritchie, John W. and J. S. Caldwell. | | | | | |
| Book I Primer of Hygiene. | 1924. 184 pages. | $.65 | | | 3–4 |
| Book II Primer of Sanitation. | 1925. 231 pages. | .65 | | | 5–6 |
| Book III Primer of Physiology. | 1923. 276 pages. | .65 | | | 7–8 |
| Health Readers. Lummis, Jessie I., and Williedell Schawe. | | | | | |
| Book I The Safety Hill of Health. | 1927. 90 pages. | $.68 | | | 1 |
| Book II Building My House of Health. | 1927. 136 pages. | .72 | | | 2 |
| Book III The Road of Health to Grown-Up Town. | 1928. 152 pages. | .76 | | | 3 |
| Book IV A Journey to Many Lands. | 1932. 199 pages. | .80 | | | 4 |

## TEACHERS' AIDS


Brock, G. D., Health Through Projects. A. S. Barnes & Co. 1932. 268 pages. $2.00

Conrad, Howard L., and J. F. Meister, Teaching Procedures in Health Education. W. B. Saunders Co. 1938. 160 pages. $1.75

Gates-Strang Health Knowledge Tests. Forms A, B, C for grades 3-8; forms D, E, F for grades 7-12. Bureau of Publications, Teachers College, Columbia University. Revised 1938. $3.15 per 100, $25.20 per 1000, single set $.15.

Grout, Ruth E., ed., Handbook of Health Education; a Guide for Teachers in Rural Schools. Doubleday, Doran. 1936. 298 pages. $2.00

Health Awareness Test. Franzen, Derryberry, and McCall. For elementary school. Bureau of Publications, Teachers College, Columbia University, 1937. $3.20 per 100, single copy $.15.

Hussey, Marguerite M., Teaching for Health. New York University Bookstore. 1938. 312 pages. $2.75

Kilander Health Knowledge Test. For grades 10 to 12 and college freshmen. Edwards Brothers, Publishers, Ann Arbor, Michigan. 1937. 8 pages. $1.40 per 25, $4.80 per 100, single copy $.15.

National Education Association and American Medical Association, Joint Committee on Health Problems in Education. Health Education; a Program for Public Schools and Teacher-Training Institutions. National Education Association, Washington, D.C. 1930. 251 pages. $1.25.

Turner, C. E., Principles of Health Education (2d ed). D. C. Heath & Co. 1939. 351 pages. $2.00

Williams, Jesse Feiring, and F. B. Shaw, Methods and Materials of Health Education. Thomas Nelson and Son. 1936. 331 pages. $2.00

Wood, Thomas D., and M. O. Lerrigo, Health Behavior. Public School Publishing Co. 1930. 150 pages. $2.00

# An Analysis of the Components of Tests of Semicircular Canal Function and of Static and Dynamic Balance

By RUTH I. BASS, Ph.D.
*University of Texas*

## INTRODUCTION

BALANCE has been generally considered as an element of motor skills or as a fundamental skill in the field of physical education. The emphasis which the Swedish balance beams received in former times, the place held by balance exercises in gymnastics and dancing at present, and recent studies[1,2,3,*] in motor skills are evidence of this.

Two types of balance are to be considered in this study. The one, *static balance,* is defined as that balance in which the equilibrium is maintained for one position of the body. *Dynamic balance* is defined as the type of balance that is concerned in keeping one's equilibrium while in motion, or while changing from one balanced position to another. Dynamic balance, then, pertains to the equilibrium evidenced through a series of changing positions taken successively.

*The Problem.*—The problem studied in this thesis fell into two divisions: first, to devise reliable tests for static and dynamic balance, as defined above; second, to analyze the intercorrelations of these tests in an effort to determine the different factors concerned in each test of the battery of tests studied, and in the function of balance as a whole.

## A REVIEW OF LITERATURE PERTINENT TO THE TESTING OF BALANCE

A. *Literature in the Field of Physical Education.*—The literature in this field dealing with the testing of balance is very limited. The article by Graybeal[16] and the article by Alden, Horton, and Caldwell[1] tell of series of tests, including one of balance, given to college women. Both include the measurement of dynamic balance by means of the balance beam, and Graybeal also includes the measurement of balance held in one position standing on the floor (static balance).

Howe and Collins[5] describe a balance board which they have developed for the measurement of balance, and report a testing for balance.

* Numbers refer to the Bibliography at end of article.

B. *Literature in the Field of Psychology and Medicine.*—Pertinent literature in these fields was grouped as follows for study purposes:

1. Literature concerning equilibrium of a static type, including discussions of factors subjectively considered to enter into this static equilibrium.[10,11,4]

2. Literature concerning response to rotation including (*a*) special case studies of pathological conditions in the vestibular labyrinth;[24,12,6,33,3] (*b*) descriptions and modifications of the Barany chair used in rotation tests; [19,18] (*c*) descriptions of the Barany technique in the rotation test and modifications of this technique advocated by others;[19,24] (*d*) experiments with animals.[2,15,25,28,29,30,32,33,35]

3. Literature concerning muscle tonus in relation to the functioning of the vestibular labyrinth.[9,14,22,28,33,39,41]

C. Points brought out in the literature which are particularly significant in connection with physical education:

1. Competent judges in the field of physical education consider balance to be one of the essential components of general motor ability.[1]

2. No particularly satisfactory means of testing or measuring static or dynamic balance, of the type used in physical activity, has been described in the literature. This is shown by the low reliabilities in methods used to date.[1,5,16]

3. Visual, kinesthetic, and tactual factors are considered to be important in connection with static balance. In previous studies,[4,10] these have been determined from subjective reactions of the subjects.

4. Muscle tonus and static and dynamic balance are considered to be functions of the vestibular labyrinth.[9,28,30,39]

D. Further points brought out in the literature and pertaining particularly to the functioning of the semicircular canals:

1. Jones and Fisher[24] prescribe the position of the head 30 degrees forward from vertical as favorable for testing reaction to rotation in the plane of the horizontal canal. They further prescribe the position of the head 120 degrees forward or 60 degrees backward for testing rotation in the plane of the vertical canals.

2. Ford and Walsh[13] think that twenty turns or more are excessive in testing reactions to rotation, and Holsopple[20] writes "It is probable that studies of vestibular response should be made in terms of the immediate normal reaction to stimulus rather than in terms of these delayed responses to an unusually prolonged stimulation."

3. Jones, Fisher, Mowrer, and Troland[24,31,37] agree that rotation in the plane of a certain semicircular canal stimulates only the ampullae of that canal, and that the effects are evidenced only through the reactions of the structures so stimulated.

*a*) Lee[26] states that rotation in an oblique plane stimulates proportionately ampullae in the three planes.

*b*) Jones and Fisher[24] state that reaction to rotation in the horizontal plane is that exclusive function of the horizontal ampullae.

4. Fearing and Fridenberg find humans are more sensitive to tilt in the lateral or frontal plane than to tilt in the sagittal or anteroposterior plane.[11,14]

## Part I. First Sampling

*Procedure.*—For the first part of the study: To devise reliable tests for dynamic and static balance, the subjects and procedure were as follows:

A group of 350 university women, in regular physical education classes, were subjects during this preliminary experimentation with the tests. Reliabilities were established with groups of women varying from 238 to 297 in number.* Correlations with subjective criteria, as given below, were determined from results of a battery of tests for static balance, one for dynamic balance, and one for sensory rhythm.[36] Intercorrelations were made between the results of the separate tests for static balance and the total static balance, and with the dynamic balance.

*Ratings of Rhythm and Motor Abilities.*—Rhythm ratings with reference to simple fundamentals obvious in folk dancing, and *general motor ratings* with special consideration of work done in sports were used as criteria for correlations in this part of the study. These ratings were made by the writer, as the only person who knew sufficiently well the abilities of all of the numerous girls concerned in the testing. Since all girls had been members of regular physical education classes for the entire year, and since reliability of motor ratings of this type is generally granted to be about .80, the ratings as made may well be recognized as reasonably valid criteria.

### TEST I: STEPPING STONE TEST—DYNAMIC

The accompanying diagram (Plate A) shows the pattern of the test with dimensions, distances, angles, and the size of circles.

*Equipment Needed.*—1. A watch with a second hand for timing.

2. The pattern for the test. If the test is to be used extensively, it is suggested that an oilcloth pattern will be found most convenient, or the pattern may be painted on the floor.

3. Chalk and yard stick.

*Directions to be Given to the Subject.*—1. Stand on the ***right*** foot in the circle marked (X). This is the starting circle.

---

* Ten trials were given. The reliabilities as recorded were computed by correlating odds against evens of the last six trials, and stepping these up by means of the Brown-Spearman prophecy formula.

2. Leap on to the *left* foot into the circle marked (1). A step counts as an error. In landing in the circle, observe the following:

*a*) *Land and stay on the ball of the foot;* do not lower the heel.

*b*) Land within the circles; do not touch the boundary lines of the circles.

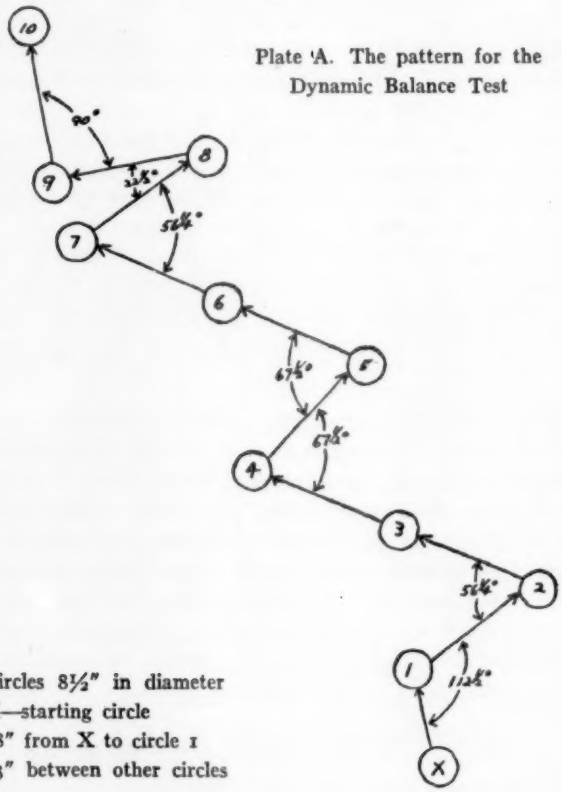



Plate A. The pattern for the Dynamic Balance Test

Circles 8½" in diameter
X—starting circle
18" from X to circle 1
33" between other circles

*c*) ***Keep the weight on the landing foot only;*** do not touch the other foot to the floor.

*d*) ***Keep the foot in contact with the floor;*** do not hop.

*e*) Keep the supporting foot still; do not slide or wriggle it along the floor in the attempt to keep balance.

*f*) ***Hold as steady a balance as possible*** up to, but not exceeding, five seconds.

It is best not to overtire on any one circle for this usually lessens the balance on the next circle. A consistent three-second hold gives a better score than a five-second hold with a number of errors followed by a one- or two-second hold.

A maximum score of five seconds per circle will give a total maximum of fifty for "timing score."*

Remember that errors should be kept at a minimum.

3. Continue leaping into the remaining circles, observing the instructions as given for circle one. Remember that the balance should be kept on the last circle as well as on the first nine circles, and that the greater the time and the fewer the errors, the better the final score.

*Suggestions for Practices.*—Give practices up to the point where the individual feels that she is doing her best, but be sure that she does not become overtired. Three practice trials, as a maximum number, should be sufficient.

After the practice trials, score the better of the next two trials. This may be thought of as giving the subject five trials, and then taking the best of the five for scoring.

*Scoring.*—The final score is the ***total "time" plus fifty, minus three times the total errors.*** This places a special penalty on errors. The person who is scoring time stands to the side of the circle number 10 and notes the time for the subject. ***This leader records the number of seconds used from the start to the finish.*** That is, from count one, at which the subject should land in the circle number 1, to the second that she loses her balance or uses the five seconds permitted in the last circle.† The leader scoring errors stands to the side and back of the subject, and follows her as she progresses. This leader records the *total errors made by the subject from the start to the finish.*‡ Remember that each of the six errors is to be scored as an error each time it is committed from start to finish.§

*Timing.*—I like the method of having one trained timer who, checking closely with a stop watch, counts the seconds aloud as follows: 1-2-3-4-5-6-7-8-9-10, 1-2-3-4-5-6-7-8-9-20, etc. This method of counting makes it easiest for the subject and the one scoring errors to be conscious of time spent in each circle.‖

A leader can then time for individuals taking the test, score the "time" from this counting, and not have to be bothered with handling a watch.

The use of a timer who is counting aloud makes it possible to have several individuals taking the test at the same time on separate patterns. If the timer gives the signal, "ready," then begins counting after a second's pause, the subject should land on circle 1 on the first

* See scoring formula under "Scoring."
† This is the total time referred to above.
‡ Errors are listed under "Directions to be Given to the Subject."
§ The error of wriggling the foot is rare, and the other five errors are the ones for which it is most necessary to watch.
‖ See 2f under "Directions to be Given to the Subject."

count. This procedure will be smoothed during the preliminary practices. The time is then noted by the leader from the count "one" on circle 1 to the second that the subject loses her balance or uses her full time on the last circle.

*Scoring Errors.*—A trained leader, for each individual taking the test, counts errors.* The errors of *lowering the heel and touching the free foot to the floor* are of such importance that they must be eliminated almost entirely. If the subject persists in either, I would suggest that either no scoring be made until practice eliminates the errors or that errors accumulate one per each second the error is continued. Only the poor in motor control may be expected to persist in these errors. I have found that practice will eliminate them in the few cases where either error has been frequent.

*Results Obtained.*—1. The test has very high reliability (.952).

2. Correlations with static balance tests are significantly high (average .344) and are higher with static balance done with the eyes open. (The highest is .47 open, and .39 closed.)

3. High correlations with criteria were found (.739 with rhythm judgment and .687 with motor judgment).

*Conclusions.*—1. A reliable test for dynamic balance has been devised.

2. The high correlations with ratings are almost startling when we consider that many other fundamentals besides balance are included in the ratings both for rhythm and general motor ability.

3. Viewed in connection with the probable reliability of ratings of motor skills, generally granted to be about .80, it seems that this dynamic test for balance should have great significance.

4. Since the static kind of balance with eyes shut correlated only about .37 with the ratings, the remainder of the correlations of the dynamic balance test with the ratings is certainly due to the other elements that are in this test, probably kinesthetic response and eye. What these are can only be conjectured now, and are subjects for future study.

## TEST II: STICK BALANCE TEST—STATIC BALANCE

*Equipment Needed.*—(1) A watch with a second hand, (2) balance sticks 1″ x 1″ x 12″, (3) pencils and score sheets.

*Subjects Studied.*—Reliabilities were established on a group of university women, averaging 270 in number for each of the following tests.

The results of tests taken by 167 university women were correlated

* See "Directions to Subject."

with the criteria and with the dynamic balance test and with the Carl Seashore Sense of Rhythm Test.[36]

*Ratings.*—The ratings used were the same as for the dynamic balance test and are described above.

*Positions for the Static Balance Test.*—

Group A. Standing, single foot, crosswise on stick, ball of foot.
1. Straight standing, eyes open.
2. Straight standing, eyes closed.
3. Bend standing (head even with hips), eyes open.
4. Bend standing, eyes closed.

Group B. Standing on ball of foot, on the floor, single stand.
5. Straight standing, eyes open.
6. Straight standing, eyes closed.
7. Bend standing, eyes open.
8. Bend standing, eyes closed.

Group C. Standing, single foot, lengthwise of stick, ball of foot.
9. Straight standing, eyes open.
10. Straight standing, eyes closed.
11. Bend standing, eyes open.
12. Bend standing, eyes closed.

*Suggestions for Practice.*—Give practice up to the point that the individual feels that she is doing her best, but be sure that she does not become overtired. Three practice trials, as a maximum, should be sufficient.

*Signals for Starting the Tests.*—At the word "ready," the subject places her supporting foot in the proper position, and touches the toe of the free foot to the floor.

At the word "go," the subject lifts her free foot and holds the prescribed position as long as possible.*

*Scoring and Counting.*—The number of seconds that the balance is held is noted by the partner and recorded by the partner.

Counting, one count per second, is done by one leader who has practiced sufficiently to be able to count accurately. She counts aloud, checking carefully with the watch.

This form of counting is recommended: 1-2-3-4-5-6-7-8-9-10, 1-2-3-4-5-6-7-8-9-20, etc.†

*Results Obtained.*—The correlations of the twelve static balance tests with the two ratings and with a duplicate test (reliability) were as follows:

* Up to and including the count of 60.

† The counting is the more easily heard, is easily scored, and the voice of the counter is put to less strain.

| Test | Rhythm Rating | Motor Rating | Reliability |
|---|---|---|---|
| 1 | .4660 | .4894 | .901 |
| 2 | .3166 | .3043 | .843 |
| 3 | .4140 | .4431 | .822 |
| 4 | .3399 | .3126 | .765 |
| 5 | .4091 | .4366 | .721 |
| 6 | .2850 | .2703 | .804 |
| 7 | .3074 | .2940 | .750 |
| 8 | .1948 | .2208 | .850 |
| 9 | .4957 | .5052 | .858 |
| 10 | .3733 | .3745 | .782 |
| 11 | .4331 | .4338 | .810 |
| 12 | .2702 | .2536 | .876 |

The average of correlations with criteria are as follows:

| | Rhythm Rating | G. M. Rating |
|---|---|---|
| Stick balance, eyes open | .3391 | .4157 |
| Stick balance, eyes closed | .2840 | .2770 |
| Floor balance, eyes open | .4644 | .4745 |
| Floor balance, eyes closed | .3217 | .3140 |

The best correlation with the criteria was *.50* with eyes open, and *.37* with eyes closed.

*A Preliminary Factor Analysis of the Balance Tests.*—Tests Nos. 2, 6, 8, 10, 12, 23,* 0† were analyzed by the Thurstone method of multiple factors. These are all tests done with the eyes closed, with the exception of Test 0. Four common or group factors were found. After the planes had been rotated, the factor loadings were found to be as follows:

| Variable | I | II | III | IV | Hypotenuse |
|---|---|---|---|---|---|
| 2 | .3757 | .4034 | .6139 | .0936 | .8304 |
| 6 | .7551 | .3914 | —.0207 | .1626 | .8662 |
| 8 | .7863 | .2058 | .0231 | .3452 | .8834 |
| 10 | .3670 | .3471 | .6485 | —.0039 | .8220 |
| 12 | .6145 | —.0006 | .3380 | .4375 | .8266 |
| 23 | .4097 | .5932 | .0564 | .3071 | .7856 |
| 0 | .1721 | .6800 | .0453 | .0532 | .7049 |
| | Kinesthetic Sense | Upright Canals | Tension Giving Reenforcement | Horizontal Canals | |

The factors were tentatively identified as follows: I, kinesthetic response; II, vertical semicircular canals, combined; III, foot tension giving reinforcement; IV, horizontal semicircular canals.‡

Attention should be called to the third factor, which I have called

* The sum of all the static balance tests just described.

† The dynamic balance test given above.

‡ The factor loadings represent zero-order correlations of the variables with these factors.

"tension giving reenforcement." This factor is present only in the stick balance tests. It is tentatively assumed that this is probably caused by the tension produced by the narrow sticks on the feet, giving a neurological "reenforcement" of the kinesthetic mechanisms. This will be discussed later in connection with the second factor analysis.

Furthermore, since all the tests analyzed, with the exception of total static balance and the dynamic balance test, were done with eyes closed, it is assumed that vision would be another factor. This hypothesis was tested later in the more comprehensive analysis.

### TEST III: SENSORY RHYTHM TEST

The Carl E. Seashore Sense of Rhythm record tests Nos. 6A and 6B were given.[36]

The reliability of the two combined was tested with a group of 286 university women, and was found to be .670, which is average for this test.

Correlations with the criteria and with the balance tests were significantly low, being as follows: (1) rhythm rating, *.2016;* (2) general motor rating, *.1783;* (3) dynamic balance, *.1679;* (4) static balance, *.11,* average; *.1125,* total.

*Conclusions for Sensory Rhythm Test.*—It seems surprising that this test correlates so poorly, especially with the rhythm rating. Apparently this particular sensory type of reaction is not the important thing in rhythm as evidenced in the physical education program.

### RESULTS OF THE COMBINED STUDY OF TESTS I, II, AND III*

Here is a contrast of the reliabilities for the tests developed in this study and those found in other studies of balance:

| | |
|---|---|
| Dynamic Balance Test | .952 |
| Static Balance Test (average) | .820 |
| Alden-Horton-Caldwell (balance beams) (1) | .450 |
| Graybeal (balance beams) (2) | .518 to .521 |
| Graybeal (floor, eyes closed) (2) | .021 |
| Collins and Howe (3) | .705 |

It is evident from this table that a much more reliable test in both static and dynamic balance has been developed. Both the static and the dynamic balance tests have been developed with the mass testing idea in mind.

2. The tests have been shown to be reliable and valid for the mass testing situation.

3. Little equipment and time are required for the administering of the tests.

4. Correlations with the Seashore Sense of Rhythm tests were all relatively low.

* Test I, dynamic balance test, p. 35 of this study; Test II, static balance test, p. 38; Test III, Carl E. Seashore Rhythm Test, p. 41.

CONCLUSIONS OF THE COMBINED STUDY OF TESTS I, II, AND III

Reliable mass tests for measuring static and dynamic balance have been developed. Techniques and scoring have been standardized, and standards formulated. Tests 1 and 9 of the static balance test group would be sufficient in testing static balance, since they correlate almost as highly with the criteria and with dynamic balance as the combined static balance test.

The correlations of the static balance test, dynamic balance tests, and criteria are significantly high. This, together with the results of the brief factor analysis carried out, suggests that:

1. Static balance, so far as shown by this part of the study, probably involves at least:

*a*) The three semicircular canals, combined into two sets.

*b*) Kinesthetic sensitivity and response.

*c*) Tensions reenforcing the goal response, balance.

*d*) Since all single static balance tests analyzed for factors were done with the eyes shut, it may be assumed that the eyes will contribute another factor. This is shown to be true in the more extended analysis below.

2. Dynamic balance involves at least:

*a*) The same factors as given above under static balance, except that (*b*) and (*c*) are much more complex and perhaps of a different type.

The correlations of dynamic balance with criteria* show:

1. That this type of balance is particularly important in sports and dancing.

2. Although the correlations of static balance with the criteria are considerably lower than the correlations of dynamic balance with the criteria, they are still high enough to suggest that this type of balance plays an important part in the criteria used. The factor analysis seems to show that dynamic balance consists of the important factors in static balance, plus other components, as yet undetermined. Thus static balance would appear as a part of the dynamic balance which appears as an important factor in the general motor and rhythm skills as rated.

## Part II. A Study of a Second Sampling

In an effort to study the factors in balance more comprehensively, a second battery of tests was set up. This battery consisted of: fourteen static balance tests, described below; the dynamic tests as given in the first part of the study; the Howe-Collins wheel balance test;[5] the Iowa revision of the Brace test;[27a] a motor ability rating and a

* See page 35.

rhythmic rating, as described above; and rotation tests* using a modified form of the Barany chair tests.†[24,18]

LIST OF TESTS USED IN THE NEW BATTERY‡

2. Howe-Collins balance wheel test.[5]
4. Dynamic balance test.
7. Iowa Revision of Brace Motor Ability Test.[27a]
9. Rhythmic judgment.
10. Motor judgment.

*Group A of Static Balance Tests.*—(Standing, single foot, crosswise of stick, ball of foot).§

11. Straight standing, eyes open.
12. Straight standing, eyes closed.
13. Bend standing (head even with hips) eyes open.
14. Bend standing, eyes closed.

*Group B of Static Balance Tests.*—(Standing, single foot, ball of foot on the floor).‖

15. Straight standing, eyes open.
16. Straight standing, eyes closed.
17. Bend standing, eyes open.
18. Bend standing, eyes closed.

*Group C, New Static Balance Tests.*—(Standing, single foot, lengthwise of stick, whole length of foot on stick).

19. Straight standing, eyes open.
20. Straight standing, eyes closed.
21. Bend standing, eyes open.
22. Bend standing, eyes closed.

*Group D, New Static Balance Tests.*—(Double standing, crosswise of stick, on balls of both feet).

23. Straight standing, eyes open.
24. Straight standing, eyes closed.

*Rotation Tests.*—¶

25. Rotation test number 1, head erect.
26. Rotation test number 2, head forward.
27. Rotation test number 3, head turned to the side.
28. A summation of scores** of rotation tests 25, 26, 27.

---

* Appendix, part III, in original thesis of writer, Iowa University Library.

† Appendix, p. 44.

‡ Numbered according to numbers for tests on the intercorrelation sheet, Table III, Appendix, part I.

§ See pp. 38-39, tests 1, 2, 3, 4.

‖ Same as tests 5, 6, 7, 8 of Static Balance Tests given on p. 39.

¶ See Appendix, part III.

** This was used in the analysis, and the correlations with this test are shown in Table III, Appendix, part I. The test adds nothing to the findings, and, being a compound, complicates things unnecessarily. Hence, it is omitted in the discussion.

*Description of Tests New to this Part of the Study.*—Group C, of the stick balance tests, is explained above, as far as the performance of the test is concerned. The whole foot was used in this group of static balance tests in Part II, in contrast with using only the ball of the foot for this group of tests in Part I. Findings in Part I had shown little difference in balance between groups B and C, that is, balance on the floor on the ball and balance lengthwise on the stick using the ball of the foot. The balance lengthwise of the stick with the whole foot introduced a less complicated test of balance.

Group D, of the stick balance tests, is also explained above, as far as the techniques of performance are concerned.

The rotation tests were given in three different positions of the head as listed above, using a modified form of the Barany chair.[19] This is described in the Appendix of the original thesis. Briefly, the rotations were made with the head in such positions as to stimulate the individual pairs of semicircular canals.

*Subjects Studied and Methods Used.*—This more inclusive battery of tests was administered to 119 university women, using for subjects those in the regular required physical education classes. The methods of administration were the same as described in tests in Part I.

*Correlations with Rhythm and Motor Judgments.*—The intercorrelations of all of these tests are found in Table III of the Appendix.* The correlations between the tests and the ratings of rhythm and motor ability respectively, are found in columns 9 and 10. These are not as high as was found with the first group studied. Again, however, balance on one foot, with the eyes open, with the stick crosswise, and with the stick lengthwise give a fair combination for judging balance as related to rhythm and motor judgments.

*The Factor Analysis.*—The intercorrelations given in Table III were put through the usual Thurstone Center of Gravity methods of analyzing for multiple factors. Ten factors were extracted, but it was easily seen that the tenth was spurious. The residuals were very small, and the factor, when plotted against the first, deviated very little from the plane of reference; it was, therefore, dropped from consideration. The crude factors, as they were extracted, are shown in Table I.

The factor loadings obtained in this method of analysis are functions of, first, the interrelationships of the variables with each other. These relationships will not be changed during the analysis, but will depend upon the intercorrelations, Table III. But the obtained "raw" loadings are also dependent upon, second, the accidental mathematical relationships imposed by the clusters of variables. This will cause the ***unrotated factor loadings*** to cluster in meaningless ways. To obtain

* This table, from the Appendix of the original thesis of the writer, has been included on pp. 48-49.

logical meaning, the factors must be "rotated." Professor Thurstone has devised a method of successive approximations, rotating two factors at a time, which leaves them in the same interrelationships at the end, but adjusts the planes of reference to cause the factor loadings to take on logical meaning. That this is scientifically defensible is shown by rotating fictitious (pre-arranged) factors by rule, without regard to knowledge of their meaning. The same values that are put

TABLE I

UNROTATED FACTOR LOADINGS

| Variables* | I | II | III | IV | V | VI | VII | VIII | IX† |
|---|---|---|---|---|---|---|---|---|---|
| 2. Howe | .220 | .142 | −.139 | .214 | −.226 | .152 | .105 | −.218 | −.032 |
| 4. Dynamic | .521 | −.116 | −.146 | .182 | −.067 | .182 | .064 | −.081 | −.156 |
| 7. Brace | .530 | −.079 | −.148 | .014 | −.089 | −.154 | .051 | −.214 | .009 |
| 9. Rhythm Judg. | .477 | −.438 | −.200 | −.144 | .276 | −.176 | .388 | −.004 | −.073 |
| 10. Motor Judg. | .561 | −.431 | −.217 | −.096 | .234 | .042 | .470 | .028 | −.073 |
| *Static* | | | | | | | | | |
| *Group A* | | | | | | | | | |
| 11. | .680 | −.145 | −.165 | −.184 | −.172 | −.152 | −.332 | −.127 | −.110 |
| 12. | .563 | .147 | .034 | −.173 | −.115 | −.100 | .245 | −.108 | −.379 |
| 13. | .664 | −.161 | −.164 | −.061 | −.325 | −.044 | −.345 | −.045 | −.193 |
| 14. | .622 | .134 | .162 | −.312 | −.182 | −.100 | .067 | −.175 | .299 |
| *Group B* | | | | | | | | | |
| 15. | .627 | .175 | .076 | .442 | .069 | −.326 | −.053 | .040 | .017 |
| 16. | .539 | .153 | −.200 | .043 | −.062 | .016 | .046 | .060 | .432 |
| 17. | .643 | .173 | .059 | .336 | −.080 | −.177 | −.086 | .063 | .464 |
| 18. | .572 | −.008 | −.024 | .170 | −.222 | .168 | .068 | .235 | .414 |
| *Group C* | | | | | | | | | |
| 19. | .629 | .104 | −.098 | .261 | .190 | −.197 | .021 | −.010 | −.263 |
| 20. | .652 | .212 | .225 | −.156 | .033 | .073 | .074 | .118 | −.101 |
| 21. | .667 | .074 | .048 | −.039 | .020 | −.010 | −.130 | .059 | −.410 |
| 22. | .482 | .254 | .237 | −.179 | .109 | −.224 | .028 | −.006 | −.134 |
| *Group D* | | | | | | | | | |
| 23. | .616 | −.030 | .028 | .218 | −.123 | .075 | .249 | .097 | .167 |
| 24. | .590 | .148 | .390 | −.332 | .115 | .222 | −.068 | −.043 | .139 |
| *Rotation* | | | | | | | | | |
| 25. | .014 | .600 | −.422 | −.225 | .134 | .088 | −.182 | −.282 | .194 |
| 26. | −.042 | −.496 | .238 | .199 | .234 | .206 | −.088 | −.208 | −.005 |
| 27. | .281 | −.622 | .505 | .306 | −.014 | −.031 | −.020 | −.067 | .245 |
| 28. | .091 | −.781 | .398 | .234 | −.227 | −.157 | −.126 | .324 | .016 |

* See Part II of this study for the full names and references for the tests listed as variables in this Table and in Table II.

† The Roman numerals heading the columns in this Table and in Table II represent the various factors which are discussed in detail on pp. 46-50.

into the analysis are recovered. This method is particularly easy to apply in the case of such correlations as these, for, in most instances, the correlations are all positive and fall into positive quadrants when rotated. Sixteen sets of rotations, involving forty-seven different two-factor rotations, were needed to rotate the factors found in this study. The final rotations are found in Table II.

It would probably be unwise to claim that these values are entirely accurate as given. Another rotation would probably produce slight variations. But the variables that are heavily loaded with each factor

would be the same, and for the purpose of identifying the factors, we can validly assume that the findings are sufficiently accurate.

*Identification of Factors.*—A "factor" is frequently something difficult to name, partly because it is relatively "pure," and we often have no word for such a specific concept. The same difficulties were found

TABLE II

ROTATED FACTOR LOADINGS

| Variables | I | II | III | IV | V | VI | VII | VIII | IX | Sum of squares |
|---|---|---|---|---|---|---|---|---|---|---|
| 2. Howe | .336 | .266 | −.122 | .180 | −.068 | .063 | −.148 | −.069 | −.029 | .267 |
| 4. Dynamic | .392 | .236 | .090 | .182 | −.065 | .312 | .032 | −.046 | .237 | .412 |
| 7. Brace | .378 | .298 | .051 | .146 | .116 | −.018 | .232 | −.023 | .256 | .389 |
| 9. Rhythm Judg. | .157 | .079 | .222 | −.036 | .054 | −.010 | .163 | −.080 | .791 | .743 |
| 10. Motor Judg. | .180 | .187 | .217 | −.016 | .022 | .166 | .028 | −.137 | .823 | .840 |
| *Static* | | | | | | | | | | |
| *Group A* | | | | | | | | | | |
| 11. | .448 | .266 | .091 | .018 | .159 | .207 | .611 | −.033 | .108 | .735 |
| 12. | .106 | .567 | −.035 | .064 | .451 | −.063 | .053 | .025 | .244 | .608 |
| 13. | .529 | .310 | .148 | −.026 | .025 | .314 | .515 | −.002 | .004 | .764 |
| 14. | .185 | .504 | .024 | .020 | .597 | .008 | .194 | −.043 | .103 | .696 |
| *Group B* | | | | | | | | | | |
| 15. | .337 | .263 | .282 | .395 | .117 | .034 | .148 | .510 | .158 | .740 |
| 16. | −.008 | .629 | −.121 | .181 | .136 | .103 | .152 | .142 | .195 | .553 |
| 17. | .664 | .028 | .100 | .185 | .081 | .288 | .110 | .474 | .097 | .823 |
| 18. | −.010 | .713 | .162 | .109 | .063 | .269 | .006 | .176 | .109 | .666 |
| *Group C* | | | | | | | | | | |
| 19. | .450 | .046 | .003 | .299 | .081 | .182 | .169 | .368 | .361 | .629 |
| 20. | .247 | .192 | .028 | .007 | .495 | .390 | .032 | .211 | .197 | .581 |
| 21. | .498 | .002 | .058 | .038 | .243 | .437 | .243 | .215 | .186 | .643 |
| 22. | .255 | .001 | −.022 | .026 | .527 | .092 | .134 | .266 | .158 | .466 |
| *Group D* | | | | | | | | | | |
| 23. | .212 | .518 | .196 | .157 | .115 | .198 | −.102 | .176 | .280 | .549 |
| 24. | .006 | .206 | .081 | .112 | .690 | .405 | .106 | −.048 | .072 | .720 |
| *Rotation* | | | | | | | | | | |
| 25. | −.057 | .125 | −.796 | .193 | .138 | −.011 | .194 | −.104 | −.083 | .764 |
| 26. | −.127 | −.187 | .467 | .334 | −.094 | .080 | −.021 | −.304 | .056 | .492 |
| 27. | −.018 | .168 | .862 | .304 | .083 | −.018 | .051 | −.064 | .047 | .880 |
| 28. | −.022 | .117 | .062 | −.140 | −.200 | .021 | .118 | .101 | −.071 | 1.030 |

with the naming of the vitamines. Sometimes a factor is hard to identify because of inadequate data. Where there are only two or three variables showing significant loadings with a factor, it is frequently hard to delimit without further data of much the same kind, but frequently good suggestions may be made for future study, and tentative identifications made. All of these difficulties are met in this study.

*Factor I.*—This factor has to do with the use of the eyes. It is present only when the eyes are open, and not present to any significant

extent when the eyes are closed. We may call it a *general eye-motor factor.*

*Factor II.*—This factor is largest in the tests taken with the eyes closed, but has some loading in almost all of the tests. It is probably a *general kinesthetic response or sensitivity factor* and corresponds to the first factor found in the first analysis. It may well be that this mechanism is less used when the eyes are open than when the eyes are closed, when the individual must depend to a very large extent upon his muscle sense and something other than vision.

*Factor III.*—This factor seems to be *general ampullar sensitivity.* It is the only factor in which large loadings are secured for these tests of semicircular canal function—and no other test shows a large factor loading with this factor. I have no explanation to offer to indicate why variable 25 is negative and the others positive. It should be pointed out, however, that a negative loading does not mean that there is no function in this factor, but that it is of an *opposite* type. For example, in factor analyses of character traits, McCloy[27] found that in the factor he called "positive action," *aggressiveness* had a positive factor loading of .78, while *modesty* had a factor loading of negative .41. It is possible that in some way variable 25 has some such negative relationship to the other two variables, 26 and 27. This will be a problem for future investigation. It seems strange, however, that the canals' functions show up so slightly in the other variables.

*Factor IV.*—This seems to be primarily the *function of the two vertical semicircular canals* other than that shown in Factor III. These two canals, of course, work together in almost all activities. Again, it is surprising that this function does not appear to a larger degree in the other variables.

*Factor V.*—This factor appears only in tests with the eyes closed, and only in balance on the sticks. It appears both in exercises with the body straight and with the body bent forward. It is probably what was called *"tension giving reenforcement"* in the first factor analysis.

*Factor VI.*—Factors VI to VIII are as yet not definitely identified. As in the case of the vitamines, when first discovered we shall have to be content to indicate them by symbols and to seek more light on their make-up later. Factor VI is present in the dynamic balance test, and in a few other tests both on the floor and on the sticks, both lengthwise and crosswise, and both standing erect and bent forward. It appears in tests with eyes open and with eyes closed. It seems therefore, to be a factor that is rather *general* in application, and may be something like muscle tonus. Such a speculation is a mere guess, however, and more data will have to be accumulated and analyzed before this factor can be identified.

## TABLE III

INTERCORRELATIONS (PART II)

| Variables | 2 | 4 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 Howe | | —2685 | —0694 | —0067 | —0959 | —0723 | —0865 | —2020 | —1258 | —2016 | —1457 | —1576 |
| 4 Dynamic | —2685 | | 2907 | 2567 | 3798 | 3307 | 1798 | 3873 | 1766 | 3349 | 2322 | 3945 |
| 7 Brace | —0694 | 2907 | | 3002 | 3982 | 3020 | 3145 | 3560 | 2658 | 2643 | 3219 | 3241 |
| 9 Rhythm Judg. | —0067 | 2567 | 3002 | | 8020 | 2758 | 2812 | 2288 | 2355 | 2061 | 2102 | 2103 |
| 10 Motor Judg. | —0959 | 3798 | 3982 | 8020 | | 3166 | 2864 | 2998 | 2796 | 2442 | 2635 | 2200 |
| 11 Static | —0723 | 3307 | 3020 | 2758 | 3166 | | 3409 | 7517 | 4411 | 3478 | 2972 | 4075 |
| 12 | —0865 | 1798 | 3145 | 2812 | 2864 | 3409 | | 2533 | 6467 | 2727 | 4882 | 1719 |
| 13 | —2020 | 3873 | 3560 | 2288 | 2998 | 7517 | 2533 | | 4242 | 3533 | 2895 | 5373 |
| 14 | —1258 | 1766 | 2658 | 2355 | 2796 | 4411 | 6467 | 4242 | | 3070 | 3810 | 2094 |
| 15 | —2016 | 3349 | 2643 | 2061 | 2442 | 3478 | 2727 | 3533 | 3070 | | 4477 | 7108 |
| 16 | —1457 | 2322 | 3219 | 2102 | 2635 | 2972 | 4882 | 2895 | 3810 | 4477 | | 1629 |
| 17 | —1576 | 3945 | 3241 | 2103 | 2200 | 4075 | 1719 | 5373 | 2094 | 7108 | 1629 | |
| 18 | —1600 | 3177 | 3872 | 1718 | 2344 | 3062 | 4739 | 2908 | 4541 | 3025 | 6009 | 3067 |
| 19 | —1711 | 3882 | 2941 | 3107 | 3688 | 4220 | 1958 | 3333 | 1897 | 5795 | 2765 | 6778 |
| 20 | —0707 | 2990 | 3224 | 1802 | 3101 | 3773 | 4116 | 3516 | 4734 | 3196 | 3263 | 4798 |
| 21 | —1507 | 3981 | 3408 | 2746 | 2739 | 4869 | 1257 | 5526 | 3210 | 4288 | 2137 | 6522 |
| 22 | —1350 | 2170 | +2102 | 0725 | 1447 | 3107 | 2881 | 1803 | 3181 | 1737 | 2306 | 3884 |
| 23 | —0126 | 2941 | 3314 | 2670 | 2321 | 5707 | 2717 | 4829 | 3489 | 3326 | 2124 | 3451 |
| 24 | —1016 | 1464 | 3117 | 1307 | 1936 | 3002 | 4363 | 2585 | 5554 | 2418 | 2889 | 1644 |
| 25 Rotation | —0180 | —1037 | —0294 | —2134 | —2114 | 0227 | 0557 | —0433 | 0994 | —0122 | 1836 | —1662 |
| 26 | —1424 | 0038 | 0860 | —1508 | —1703 | 0211 | 1090 | 0158 | —0003 | 0382 | 0596 | 1925 |
| 27 | —0783 | —1436 | —0705 | —2449 | —2680 | —1332 | —0396 | —1372 | —0815 | —1735 | —0445 | —0283 |
| 28 | —1135 | —1260 | —0324 | —2660 | —2790 | —0618 | —0447 | —0831 | —0204 | —0806 | —1228 | —0504 |

TABLE III—(Continued)

| Variables | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 Howe | —1600 | —1711 | —0707 | —1507 | —1350 | —0126 | —1016 | —0180 | —1424 | —0783 | —1135 |
| 4 Dynamic | 3177 | 3882 | 2990 | 3981 | 2170 | 2941 | 1464 | —1037 | 0038 | —1436 | —1260 |
| 7 Brace | 3872 | 2441 | 3224 | 3408 | 2102 | 3314 | 3117 | —0294 | 0860 | —0705 | —0324 |
| 9 Rhythm Judg. | 1718 | 3107 | 1802 | 2746 | 0725 | 2670 | 1307 | —2134 | —1508 | —2449 | —2620 |
| 10 Motor Judg. | 2344 | 3688 | 3101 | 2739 | 1447 | 2321 | 1936 | —2114 | —1703 | —2680 | —2790 |
| 11 Static | 3062 | 4220 | 3773 | 4869 | 3107 | 5707 | 3002 | 0227 | 0211 | —1332 | —0618 |
| 12 | 4739 | 1958 | 4116 | 1257 | 2881 | 2717 | 4363 | 0557 | 1090 | —0396 | —0447 |
| 13 | 2907 | 3333 | 3516 | 5526 | 1803 | 4829 | 2585 | —0433 | 0158 | —1372 | —0831 |
| 14 | 4541 | 1897 | 4734 | 3210 | 3181 | 3489 | 5554 | 0994 | —0003 | —0815 | —0204 |
| 15 | 3025 | 5795 | 3196 | 4288 | 1737 | 3326 | 2418 | —0122 | 0382 | —1735 | —0806 |
| 16 | 6009 | 2765 | 3263 | 2137 | 2306 | 2124 | 2889 | 1836 | 0596 | —0445 | —1228 |
| 17 | 3067 | 6778 | 4798 | 6522 | 3884 | 3451 | 1644 | —1662 | 1925 | —0283 | —0504 |
| 18 | | 2150 | 3136 | 1911 | 2612 | 2061 | 2676 | 0199 | —0074 | —3198 | —0440 |
| 19 | 2150 | | 4002 | 5114 | 2517 | 4485 | 1887 | 0606 | 0468 | —0184 | —0486 |
| 20 | 3136 | 4002 | | 5371 | 4387 | 4431 | 5715 | 0254 | 0526 | —1159 | —0544 |
| 21 | 1911 | 5114 | 5371 | | 4270 | 5370 | 3668 | 0289 | —0291 | —0439 | —0238 |
| 22 | 2612 | 2517 | 4387 | 4270 | | 3524 | 5111 | 0863 | —0257 | —0166 | —0387 |
| 23 | 2061 | 4485 | 4431 | 5370 | 3524 | | 4466 | 0359 | —0076 | —1370 | —0684 |
| 24 | 2676 | 1887 | 5715 | 3668 | 5111 | 4406 | | 0908 | 0209 | —4336 | —0451 |
| 25 Rotation | 0199 | 0606 | 0254 | 0289 | 0863 | 0359 | 0908 | | 3804 | +4801 | +7502 |
| 26 | —0074 | 0468 | 0526 | —0291 | —0257 | —0076 | 0209 | 3804 | | +3052 | +6687 |
| 27 | —3198 | —0184 | —1159 | —0439 | —0166 | —1370 | —4336 | +4801 | +3052 | | +8478 |
| 28 | —0440 | —0468 | —0544 | —0238 | —0387 | —0684 | —0451 | +7502 | +6687 | +8478 | |

*Factor VII.*—This factor is present only in tests with the eyes open, and only on one foot, *crosswise* of the sticks. It may be an eye factor, perhaps something like judgment of distance forward and backward. If so, it does not apply to the tests on both feet crosswise of the sticks.

*Factor VIII.*—This factor is present only in tests with eyes open, and when standing *lengthwise* on the sticks.

*Factor IX.*—This is probably not a balance factor at all. The only high loadings are for the two ratings of ability in rhythmic activities and general motor ability. It is probably not a primary factor at all, but a compound, and cannot be further broken up in this analysis because of a lack of other narrowly constituted variables with the proper types of components. Since this study is primarily one of factors of balance, factor IX can be disregarded. It is probably a compound of a number of elements of educability in the motor field.

The Howe-Collins teeter board balance test does not seem to be a very satisfactory test. Either the unreliability is high or the test measures something not included in these factors, for the communality (sum of the squares of the factor loadings) is very low.

The test of dynamic balance does not show a predominance of any *one* factor, but is made up in this study of loadings from factors I, II, and VI. It apparently also measures something other than these types of balance, as the reliability is satisfactory, but the communality is low. It probably measures some types of motor educability, tests for which were not included in this study.

The Iowa Revision of the Brace Test (for motor educability) is high primarily in factors I, II, and VII. It also appears in factor IX.

## SUMMARY

In analyzing nineteen tests of balance and semicircular canal function, together with three other variables, nine were found, one of which was apparently not a balance factor (IX). Of the other eight, five are tentatively identified, while three are not identified except in the sense of describing all too sketchily the tests in which the factors were found. It would seem that the semicircular canals do not function in ordinary tests of balance as much as is usually thought to be the case.

The major contribution of this part of the study lies in the fact that it is shown that the general function of balance is composed of a number of different factors or components. One of these is obviously concerned only with the functioning of the eyes in balance. Others function only when the eyes are open, hence there are probably several functions of the eyes in balance.

Other factors function most when the eyes are closed, when not aided by vision, and hence must concern other functions than vision.

Again there is more than one factor concerned in such functions. A careful study of the factors that have not been identified, as well as of those that have, should enable us to devise appropriate tests to separate more adequately the different factors, to better identify them, and eventually to understand the separate mechanisms involved and to measure each one accurately. This study may be considered as a rather extensive exploratory study into a new field, the results of which will lead to further investigations which, because of the findings here presented, may be more effectively organized.

## BIBLIOGRAPHY


1. Alden, Florence D., Margery O'Neal Horton, Grace Marie Caldwell, "A Motor Ability Test for University Women for the Classification of Entering Students into Homogeneous Groups," RESEARCH QUARTERLY, 3:1 (March 1932) 85-131.
2. Ashcroft, D. W., and C. S. Hallpike, "On the Function of the Saccule," *J. Laryng. and Otol.*, 49: 7 (1934) 150-158, (frog).*
3. Auerbach, D. S., "A Case of Labyrinth Fistula with Complete Loss of Cochlear Function and Persistence of Normal Vestibular Function," *Ann. Otol., Rhin., and Laryng.*, 26 (1917) 117-120, (human, medical).
4. Brammar, George, "The Static Equilibrium of Airplane Pilots," *J. Comp. Psychol.*, 5: 5 (1925) 345-366, (human, pilots).
5. Collins, Vivian D., and Eugene C. Howe, "The Measurement of Organic and Neuromuscular Fitness," *American Physical Education Review*, 29 (February 1924) 64-70.
6. Dandy, W. E., "A Case Study of So-called Pseudo Meniere's Disease," *Bul. Johns Hopkins Hosp.*, 55 (1934) 232-239. (human operative).
7. Dockeray, F. C., and S. Isaacs. "Psychological Research in Aviation in Italy France, England, and the American Expeditionary Forces," *J. Comp. Psychol.*, 1 (1921) 115-147, (human, pilots).
8. Dodge, R., "Habituation to Rotation," *J. Exper. Psychol.*, 6 (1923) 1-35; (human).
9. Dorcus, R. M., and C. H. Mowrer, "An Experimental Analysis of the Vestibular Pointing Test," *Ann. Otol., Rhin., and Laryng.*, 45: 1 (1936) 33-57, (human).
10. Fearing, F. S., "Factors Influencing Static Equilibrium and Effects of Practice," *J. Comp. Psychol.*, 4 (1924) 163 (human).
11. Fearing, F. S., "Factors Influencing Static Equilibrium," *J. Comp. Psychol.*, 4 (1924) 119, (human).
12. Fisher, Lewis, and I. H. Jones, see Jones (24).
13. Ford, Frank R., and Frank B. Walsh, "Vestibular Reflexes in Ocular Movements," *Bul. Johns Hopkins Hosp.*, 58 (1936) 80-99, (human, clinical).
14. Fridenberg, Percy, "Visual Factors in Equilibrium," *J. Amer. Med. Assn.*, 70: 2 (1918) 991-992, (human, medical).
15. Gould, Harley N., "On the Vestibular Labyrinth of the Albino Rat after Prolonged Rotation," *J. Comp. Psychol.*, 41 (1926) 223-351, (albino rats).
16. Graybeal, Dr. Elizabeth, *The Measurement of Outcomes of Physical Education for College Women*, (Minneapolis: University of Minnesota Press, 1937).
17. Griffith, C. R., "The Organic Effects of Repeated Bodily Rotation," *J. Exper. Psychol.*, 3 (1920) 15-46.
18. Hobhouse, Edmond, "Aural Vertigo," *Lancet*, 206: 1 (1924) 821-822, (human, clinical).


* Key words denoting the type of subjects are given for each reference from the fields of medicine and psychology.

19. Holsopple, J. Q., "A New Rotating Chair for Vestibular Stimulation," *Psychol. Bul.*, 32 (1935) 570, (description of chair).
20. Holsopple, J. Q., "Some Effects of Duration and Direction of Rotation of Post-Rotational Nystagmus," *J. Comp. Psychol.*, 3 (1923) 85-100, (human).
21. Holsopple, J. Q., "An Explanation for Unequal Reduction of Post-Rotational Nystagmus," *J. Comp. Psychol.*, 4 (1924) 185-193, (human).
22. Howell, Wm. H., *A Textbook of Physiology*, (Philadelphia: W. B. Saunders Co., 1930).
23. Huizinga, E., "On the Tonic and Dynamic Function of the Cristae," *Octa. Oto. Laryng., Stock.*, 24 (1936) 82-95.
24. Jones, I. H., and Lewis Fisher, "Technique of Examination of the Static Labyrinth," *Ann. Othol., Rhin., and Laryng.*, 26 (1917) 1-30, (human, clinical).
25. Kobrak, Heinrich, "Influence of Mid-Ear on Labyrinth Pressure," *Arch. Otol. Laryng.*, 21 (1935) 547-560, (rabbits, dogs, both dead and alive).
26. Lee, H. E., *Journal of Physiology*, 15 (1903) 328.
27. McCloy, C. H., "A Factor Analysis of Personality Traits to Underlie Character Education," *Jr. of Ed. Psychol.*, 27: 5 (May 1936) 375.
27a. McCloy, C. H., "An Analytical Study of the Stunt Type Test as a Measure of Motor Educability, RESEARCH QUARTERLY, 8: 3 (October 1937) 46-56.
28. Maxwell, S. S., "The Effect of Repeated Rotation on the Duration of After-Nystagmus, in the Rabbit," *Am. J. Physiol.*, 28 (1922) 432-438, (rabbits).
29. Maxwell, S. S., "Labyrinth and Equilibrium," *Jr. Gen. Physiol.*, 2 (1919) 123-153, (dog-fish).
30. Mowrer, O. H., "The Nystagmic Response of the Pigeon to Constant Angular Acceleration at Liminal and Supra Liminal Intensities," *J. Comp. Psychol.*, 19 (1935) 177-193, (pigeon).
31. Mowrer, O. H., "Concerning the Normal Function of the Vestibule," *Ann. Otol., Rhin., and Laryng.*, 41 (1932) 412-422, (human).
32. Mowrer, O. H., "An Analysis of the Effects of Repeated Bodily Rotation with Special Reference to the Possible Impairment of the Static Equilibrium," *Ann. Otol., Rhin., and Laryng.*, 43 (1934) 367-383, (human).
33. Pike, F. H., "The Function of the Vestibular Apparatus," *Physiol. Rev.*, 5 (1923) 209-239.
34. Parkinson, S. M., "Meniere's Symptoms Complex; Endolymph Decompression with Symtomatic Improvement," *Ann. Otol. Rhin., and Laryng.*, 44 (1936) 328-386, (human, medical).
35. Ross, D. A., "Electrical Studies on the Frog's Labyrinth," *J. Am. Med. Assn.*, 86 (1936) 117-146, (frog).
36. Seashore, Carl E., "Seashore's Measurement of Musical Talent, Catalog No. 42060-6 (53005D)" (Record) *Sense of Rhythm*, Nos. 6A and 6B, C. H. Stoelting Company, Chicago.
37. Troland, Leonard T., *The Principles of Psychophysiology*, Vol. II, (New York: D. Van Nostrand Co., 1930).
38. Warren, Howard C., and Leonard Carmichael, *Elements of Human Physiology*, (Houghton Mifflin Co., 1930).
39. Wilson, J. G., "The Relation of Labyrinthine Tonus to Muscular Tonus," *J. Am. Med. Assn.*, 78 (1922) 557-562, (general summary).
40. Woodworth, Robert S., *Psychology, a Study of Mental Life*, (Henry Holt and Company, 1921).

# A Health Knowledge Survey

By David T. Loy, M.D.
and M. W. Husband, M.D.

*From the Student Health Service, Kansas State College*

LEADING educators recognize that health education is of vital importance in the education of youth. The problem of measurement of health education is very complex, for it is desirable to measure not only knowledge, but conduct, judgment, experience, attitudes, and habits as well. Of the factors mentioned it is only health knowledge which can be measured with written tests. The other factors must be measured by various types of observation procedure. Since health knowledge is fundamental in furnishing rational motives for attitudes and habits, we feel that the knowledge of health practices is of value.

Health knowledge tests are now being used for many purposes other than to find the number of facts with which the student is acquainted. The test properly constructed and applied may be stimulating, motivating, interesting, and diagnostic of class as well as individual weaknesses and strengths. The Student Health Service at Kansas State College in contemplating the inauguration of an elective health course for college students planned a health knowledge survey as a diagnostic procedure whereby a better understanding of the subject matter to be included in such a course could be gained.

The health knowledge test used by Forsythe and Rugen[1] was chosen as a basis for the test to be used in making the survey. Many of the same questions in their original form and many of the ideas for revised questions were used from this test. Since recall questions such as the completion type frequently have several answers, all of which may be true, the reliability and objectivity of the questions are reduced. For this reason the test was revised to include only true-false and multiple-choice questions. It is recognized that true-false questions fail to measure knowledge accurately because of the guessing element and the commonness of ambiguity. However, for purposes of expediency in conducting the test this type of question was included. In analyzing the results, the limitations of true-false questions in measuring knowledge have been overcome partially by subtracting the incorrect from

We are indebted to Professor J. C. Peterson, Department of Education, for valuable assistance in advising us in the method used in analyzing these tests, and to Dean R. W. Babcock, Division of General Science, for suggesting and computing the quotas of students proportional to enrollment in each class and division.

[1] W. E. Forsythe and M. E. Rugen, "A Health Knowledge Test," Research Quarterly, 6; 2 (May 1935) 105.

the correct and ignoring the unanswered to obtain the true-false score. Forsythe and Rugen have shown that this method gives results more like the results of multiple-choice and completion types of health questions than the method of using the total correct for the true-false score.

Kansas State College has a total undergraduate enrollment of approximately 3,500 students. These students are enrolled in five college divisions: Agriculture, Engineering, General Science, Home Economics, and Veterinary Medicine. The test was given to 1,002 students assembled *en masse*. This group of students consisted of approximately 250 students from each of the four classes, freshman, sophomore, junior, and senior. The number from each division representing the class was based on the enrollment of students in that particular division. The test was proposed to the students of each college division on a voluntary basis by their respective deans who selected the students and recommended that they take the test. To allow for failure to appear, 10 per cent more than the quota needed in each division were asked to take the test. In the division of agriculture 20 per cent more were asked because many students in that division work in addition to attending college and would not be able to take the test at the hour scheduled. The test was given during the second semester of the 1937-1938 school year.

Table I gives the exact number of students tested in each division and class. The test, except for a few selected questions, is reported in a previous issue of the Quarterly.[2]

TABLE I

COLLEGE DIVISION AND CLASS DISTRIBUTION OF STUDENTS TESTED

| College Division | Freshman | Sophomore | Junior | Senior | Total |
|---|---|---|---|---|---|
| Agriculture | 41 | 50 | 46 | 40 | 177 |
| Engineering | 75 | 66 | 79 | 84 | 304 |
| General Science | 60 | 47 | 68 | 71 | 246 |
| Home Economics | 44 | 41 | 54 | 52 | 191 |
| Veterinary Medicine | 15 | 17 | 24 | 19 | .. |
| (Pre-Vet.) | 9 | .. | .. | .. | 84 |
| Total | 244 | 221 | 271 | 266 | 1002 |

In the test given by Forsythe and Rugen and in the test given at Kansas State College it is interesting to note that more than 80 per cent of the students answered the following identical questions incorrectly. These errors, we feel, are representative of the misconceptions of the general public regarding these facts.

1. Deep breathing exercises taken voluntarily in front of an open window standing still are of no health value.

2. The accumulation of carbon dioxide in unventilated living rooms is a menace to health.

[2] Forsythe and Rugen, *op. cit.*

3. The depletion of oxygen from rebreathing air in closed living rooms injures one's health.

4. If a pandemic of influenza like that of 1918 were known to be returning next fall, we would be in no better position to handle it than when we had no such warning.

As previously mentioned, the true-false score was obtained by subtracting the total number of incorrect answers from the total number of correct answers, ignoring the unanswered. The multiple-choice score was determined by the total number of correct answers. The percentage score was obtained by adding the true-false and multiple-choice scores and dividing by the total number of questions in the test.

TABLE II

| College Division | Class | Percentage Range | Percentage Average |
|---|---|---|---|
| Agriculture | | | |
| | Freshmen | 18–67 | 42 |
| | Sophomore | 23–54 | 47 |
| | Junior | 30–66 | 50 |
| | Senior | 36–71 | 51 |
| Engineering | | | |
| | Freshmen | 20–59 | 43 |
| | Sophomore | 24–73 | 44 |
| | Junior | 18–69 | 48 |
| | Senior | 31–72 | 49 |
| General Science | | | |
| | Freshmen | 25–68 | 44 |
| | Sophomore | 22–70 | 46 |
| | Junior | 27–72 | 50 |
| | Senior | 32–74 | 60 |
| Home Economics | | | |
| | Freshmen | 27–78 | 51 |
| | Sophomore | 44–74 | 54 |
| | Junior | 44–72 | 55 |
| | Senior | 46–77 | 60 |
| Veterinary Medicine | | | |
| | Pre-Vet. | 35–52 | 42 |
| | Freshmen | 50–68 | 52 |
| | Sophomore | 43–72 | 61 |
| | Junior | 56–82 | 62 |
| | Senior | 46–77 | 61 |

Table II shows the percentage range and the percentage average of each group of students tested. The college divisions in order of highest average score are veterinary medicine, home economics, general science, agriculture, and engineering. In the home economics division, courses which include material pertaining to many of the subjects in the test are given as part of the curriculum. In the division of general science a hygiene course is offered for physical education majors. Since not more than one per cent of the group in this division were physical education majors, the effect on the average score is of no great signifi-

cance. The scores of the female and male groups of students in the division of general science were averaged and there was a negligible difference in the average scores. Throughout the classes in each division with the exception of veterinary medicine there is a slight progressive increase in the average scores from the freshman group to the senior group, thus showing that during the four years of college there is some acquisition of health knowledge even in instances in which there is no specific health instruction.

Nearly all the questions may be placed in nine general subject groups. The rating of these groups according to the percentage of correct answers is given in Table III.

TABLE III

| Number of questions averaged | Subject | Percentage correct |
|---|---|---|
| 13 | Health statistics | 50 |
| 16 | First aid, health habits, physical exercise and posture | 51 |
| 23 | Communicable diseases other than tuberculosis | 58 |
| 8 | Anatomy and physiology | 63 |
| 11 | Tuberculosis | 72 |
| 13 | Public Health | 74 |
| 15 | Mental hygiene | 76 |
| 29 | Medical care | 79 |
| 13 | Nutrition and Diet | 80 |

In comparing the subject matter rating of this health knowledge test with the results obtained by Forsythe and Rugen it may be noted in both tests that the greatest lack of knowledge is in health statistics and first aid, while the greatest possession of knowledge is in mental hygiene and medical care except in the Kansas State College group where knowledge of nutrition and diet ranks exceptionally high. This may be accounted for by the fact that the home economics and veterinary medicine groups were included in the students tested at Kansas State College.

In conclusion, we feel that this survey has shown that there is not sufficient acquisition of health knowledge without special instruction to enable the mass of students to become desirably well informed on the essentials of healthful living.

REFERENCES

1. Kilander, H. F., "Health Knowledge of High School and College Students," RESEARCH QUARTERLY, 8: 3 (October 1937) 3.
2. Conrad, H. L., "Health Education," *Mind and Body*, 42: 429 (October 1935) 134; 42: 430 (November 1935) 173; 42: 431 (December 1935) 218.

# The Fair Sex in Greek Society

By Thomas Woody
*School of Education*
*University of Pennsylvania*

## I

HISTORY holds a mirror up to life. Therein are reflected the varied patterns and tendencies of human existence in times past. But past and present constitute a continuum, in which the various phases of the life cycle succeed each other, and the whole repeats the whole, the same, or nearly so, as Thucydides declared. With respect to the woman question, Greek society ran through a wide range of experience: we can see her in a rather primitive feudal society, bought and sold, or given away like so much property; on a plane of greater equality, but not too high, in the limited communism of Sparta; in sheltered, almost oriental seclusion in the best families of Athens. We can also glimpse the dawning day of her emancipation from age-old subjection, though that day was soon o'ercast and not till later ages were its promises in some degree redeemed. Even yet, fulfillment is not complete in the most advanced sectors; and in others retrogression has set in. To a world divided between protagonists of woman's equality and those who would rehabilitate her in her one-time exclusive sphere, a reexamination of the panorama of Greek development is of interest.

## II

The heroic society of that golden age depicted by Homer had far outstripped its neighbors in numerous ways. But though it had made progress in agriculture, industry, and commerce, and boasted its ninety cities that crowned the famous shore, and though some degree of orderly government had been established, it still bore many traces of primitive culture.

In respect to woman, the primitive character of Homeric society is quite clear. Children seem to have been held in high regard: fathers desired many, but boys especially. In childhood both girls and boys engaged in games. Nausicaa, we see, playing at ball with her maidens on the shore. Girls are frequently mentioned as dancing, both for pleasure and ceremonially. As they grew older, the girls, like boys, learned by apprenticeship to life those duties that would devolve upon them. Nausicaa, although a princess, washed clothing; and queenly Helen and Penelope engaged in carding, spinning, weaving, and other domestic pursuits.

This paper was presented as an address before the faculty and students, New Jersey College for Women, February 15, 1939.

Though nobility of character and loveliness are ascribed to certain women of Homer, the lot of the female was lowly, even as in most patriarchal societies. She was "not a person, but a thing, . . . a perpetual minor."[1] A double standard required chastity of her before marriage, but not of the male. Though the wife had more rights than her husband's concubines, both she and they were a sort of property: the first, he generally paid for and wed with ceremony; the second, like slaves, he took by force as prize of war, or as reward for skill. Women, whose value was unblushingly computed as so many cattle, were disposed of by their masters like any other property. Thus, to appease the sulking Achilles, Atrides offers sacred tripods, horses, gold, cauldrons, in great number, and besides:

> Seven Lesbian ladies he shall have, that were the most select,
> And in their needles rarely skill'd, whom, when he took the town
> Of famous Lesbos, I did choose; who won the chief renown
> For beauty from their whole fair sex . . .[2]

Moreover, if victory be theirs at Troy, Achilles with

> . . . that princely hand of his
> Shall choose him twenty Trojan dames . . .[3]

And, even if defeated, they return from Troy, Achilles shall have his choice of three daughters, richly dowered with seven cities.

## III

Following the golden age came the bitter age of iron, the middle ages in the development of Greek civilization, when the Dorian invaders established themselves as masters in the lower Peloponessus and continued to maintain supremacy by the same means by which they had gained it. War became the vocation of the citizen. Of Spartan boys, the words of the poet might fitly have been spoken:

> From their first youth unto their utmost age,
> Appointed the laborious wars to wage.

Conquest and continued military dominion over the vanquished natives were the prime determiners of the character of woman's sphere and education within the master class, the *Spartiates*. Spartan training of the citizen-soldier was based, first of all, upon a unique concern for the training of girls, that they might become the brave mothers of stalwart sons. Though of the details of this training little can be said, Plutarch, in the following passage, describes the general provisions by which Lycurgus aimed to achieve that female perfection which would be most serviceable to the military state: "The truth is, he took in their case, also, all the care that was possible; he ordered the maidens to exercise themselves with wrestling, running, throwing the quoit, and casting the dart, to the end that the fruit they conceived might, in

[1] A. G. Keller: *Homeric Society*, 243. (Longmans: New York, 1902).
[2] Chapman's *Iliad*, IX, 132–35. (J. R. Smith: London, 1865).
[3] *Ibid.*, 141–42.

strong and healthy bodies, take firmer root and find better growth, and withal that they, with this greater vigor, might be the more able to undergo the pains of child-bearing. And to the end he might take away their over-great tenderness and fear of exposure to the air, and all acquired womanishness, he ordered that the young women should go naked in the processions, as well as the young men, and dance, too, in that condition, at certain solemn feasts, singing certain songs, whilst the young men stood around, seeing and hearing them. On these occasions, they now and then made, by jests, a befitting reflection upon those who had misbehaved themselves in the wars; and again sang encomiums upon those who had done any gallant action, and by these means inspired the younger sort with an emulation of their glory . . . Nor was there anything shameful in this nakedness of the young women; modesty attended them, and all wantonness was excluded. It taught them simplicity and a care for good health, and gave them some taste of higher feelings, admitted as they thus were to the field of noble action and glory."[4]

Though the organization for their training was probably less exacting than that for boys and though they dwelled at home rather than in public barracks, they seem to have been associated in herds (*agelai*) for the purpose of training, as were the boys, but separate from them, and had their special gymnasia (*dromoi*), where they exercised in running, wrestling, jumping, dancing, hurling the javelin and discus, and playing ball.[5] It has been asserted, though not on good authority, that they also practiced the Pancration.[6] Girls also learned to swim and ride horseback; women at times entered horses in the races. At the festival of Hyacinthia they raced on horses. Pausanias relates that Cynisca, daughter of Archidamus "was passionately fond of the Olympic games, and was the first woman who bred horses and won an Olympic victory." After her, "other women, chiefly Lacedemonian," won victories at Olympia, but "none of them was more famous . . . than she."[7] One of these was Euryleonis who won a two-horse chariot victory; to her, Pausanius says, a statue was erected.[8]

Lampito, the Spartan woman in *Lysistrata*, boasts that she can jump and kick her buttocks, an exercise known to many lands besides Sparta. According to Pollux, one Spartan maid was able to repeat the trick a thousand times, and it was recorded on her tomb. This exercise, says Grasberger, the Spartans called *βίβασις* and regarded as be-

[4] Plutarch: *Lives*, I, 101–102. (Tr. by Dryden, corrected and revised by A. H. Clough. 5 vols. Little, Brown, and Co.: Boston, 1909).

[5] L. Grasberger: *Erziehung und Unterricht im Klassischen Altertum*, III, 503 *ff.* (3 vols. Stahel'schen Buch-und Kunsthandlung: Würzburg, 1864-1881); J. H. Krause: *Die Gymnastik und Agonistik der Hellenen*, I, 31*ff.*; II, 688 *ff.* (2 vols. Barth; Leipzig, 1841).

[6] Krause: *op. cit.*, I, 55.

[7] Pausanias: *Description of Greece*, Bk. III, 8, 1. (Tr. by J. G. Frazer. 6 vols., Macmillan: London, 1898).

[8] *Ibid.*, Bk. III, 17, 6.

longing to dancing, both "boys and girls practising it diligently for strengthening the legs."

Running was, with girls as with boys, probably the most excellent exercise. Theocritus pictures a band of 240 maidens, the flower of the land, who anoint themselves and run by the River Eurotas. In honor of Dionysus Colonatas, according to Pausanias,[9] a special race was run by eleven women, called Dionysiades. At Olympia, there was a special festival, the Heraea, for women. Here there were two choruses, one the Hippodamia, the other the Physcoa, and games—races—between virgins. Pausanias describes them thus: "The virgins are not all of the same age; but the youngest run first, the next in age run next, and the eldest virgins run last of all. . . . their hair hangs down, they wear a skirt that reaches to a little above the knee, the right shoulder is bare to the breast. The course assigned to them . . . is the Olympic stadium; but the course is shortened by about a sixth of the stadium. The winners receive crowns of olive and a share of the cow which is sacrificed to Hera; moreover, they are allowed to dedicate statues of themselves with their names engraved on them."[10]

Girls marched in religious processions, participated in choruses, and danced on certain festal occasions. At times young men and maidens danced together, under the direction of choral leaders. Such a scene is depicted in *Lysistrata,* as the dance begins:

> Now, take your ladies; you, Laconians, those,
> And you, take these; then standing side by side,
> Each by his partner, lead your dances out
> In grateful honor to the Gods . . .

And thus runs the Laconian chorus:

> Leave Taygety, an' quickly
> Hither, Muse Laconian, come.
> Hymn the Gude o' braw Amyclae,
> Hymn Athana, Brassin-dome.
> Hymn the Tyndarids, for ever
> Sportin' by Eurotas river.
> Noo then, noo the step begin,
> Twirlin' licht the fleecy skin;
> Sae we'se join our blithesome voices,
> Praisin' Sparta, loud an' lang,
> Sparta wha of auld rejoices
> In the Choral dance an' sang.
> O to watch her bonnie dochters
> Sport alang Eurotas' waters!
> Winsome feet for ever plyin',
> Fleet as fillies, wild an' gay,
> Winsome tresses tossin', flyin',
> As o' Bacchanals at play.
> Leda's dochter, on before us,
> Pure an' sprety, guides the Chorus.

[9] *Ibid.*, Bk. III, 13, 5.
[10] *Ibid.*, Bk. V, 16.

Onward go,
Whilst your eager hand represses
A' the glory o' your tresses;
Whilst your eager foot is springin'
Like the roe;
Whilst your eager voice is singin'
Praise to Her in might excellin'
Goddess o' the Brassin Dwellin'.[11]

Though Plutarch declares Lycurgus ordained that maidens should march in the processions, and dance too, at certain feasts, without clothing, "whilst the young men stood around," it seems probable that they were not "entirely uncovered." Grasberger, citing Pollux especially as proof, holds that in exercising the girls were attired in the *chiton*, a shirt somewhat longer than the boys' garment which was slit at the side permitting free exercise of the limbs and showing the thighs. Hence the reference to "thigh-showers."

How long girls were given physical training is unknown, but Plato, who follows the Spartan system in many respects, and may have done so here, would provide for compulsory physical training from thirteen to eighteen, or, if desired, till twenty. Possibly Spartan girls began exercises about seven, as did boys, and one may infer that they continued gymnastics in public until marriage, when they donned the veil.

The results of Spartan efforts in respect to physical culture were at once a source of pride on their own part, and of ridicule very often, at the hands of their neighbors. Spartan women are said to have been the most beautiful in all Greece.[12] Gorgo, wife of Leonidas, is said to have boasted: "We are the only women who bring forth men."[13] Aristophanes, doubtless, saw a chance to cause a laugh at Spartan expense, when he made Lysistrata say of Lampito:

O the sweet girl! how hale and bright she looks!
Here's nerve! here's muscle! here's an arm could fairly throttle a bull!

To which the buxom dame replies:

Weel, by the Twa, I think sae.
An' I can loup and fling and kick my hurdies.[14]

As to whether the training of girls had the effect of making them brave and serviceable to the state, there is a difference of opinion. Both the favorable and unfavorable judgments may well be partly true. Philostratos expressed the opinion that "Laconia became great in war" because of her procedure in respect to the physical training of girls, who, when united with men similarly trained, gave birth to sturdy

[11] *Aristophanes*, III, 121-123. (Tr. by B. B. Rogers. 3 vols. Heinemann: London, 1924).
[12] C. O. Müller: *The History and Antiquities of the Doric Race*, II, 292. (Tr. by H. Tufnell and G. C. Lewis. 2 vols. Murray: London, 1839.)
[13] Plutarch: *Lives*, I, 102.
[14] *Aristophanes*, III, 13.

children.[15] At the time when Pyrrhus attacked Sparta, Plutarch tells us that Archidamia "came into the senate with a sword in her hand . . . asking if the men expected the women to survive the ruins of Sparta; and refused, in the name of all the women to be sent out of the city." Later, "both maids and women," he says, "assisted the elder men at the work" of making the trench and sinking the wagons, and exhorted the young men to "defend and keep it bravely . . . as became Spartans."[16] At the battle of Leuktra, it is said, "The women outdid the men" in putting on a brave front, when news came of defeat and the death of their relatives, "openly rejoicing, cheerfully making visits to one another, and meeting triumphantly in the temples."[17] With the invasion of Laconia, however, which followed upon the defeat at Leuktra, even Plutarch admits that Agesilaus was "disturbed at home with the tumults of the city, the outcries and running about of the old men, who were enraged at their present condition, and the women, yet worse, out of their senses with the clamors, and the fires of the enemy in the field."[18] Aristotle's judgment may be open to question, since he disapproved decidedly of the freedom which Lacedaemonian women enjoyed, but, of the effect of Spartan discipline on the courage of women and its serviceability when put to the extreme test in war, he says: "Even in regard to courage, which is of no use in daily life, and is needed only in war, the influence of the Lacedaemonian women has been most mischevious. The evil showed itself in the Theban invasion, when, unlike the women in other cities, they were utterly useless and caused more confusion than the enemy."[19]

## IV

The relatively independent position of Spartan women contrasts sharply with that of Athenians, particularly, if one considers the low estate of women in the days of imperial Athens. As a matter of fact, the position of women varied much from time to time and from place to place in ancient Greece. There is one picture of the noble women of the aristocratic Homeric society; another of the poorer sort in Hesiod; still others in Aristophanes, Xenophon, Euripides, Aristotle, and Plato. Authors writing of the same time may give conflicting views; indeed the views of one and the same author often seem conflicting and have been variously construed. Thus, Euripides is a misogynist to some; but a painter of women's great excellence and a propagandist for her emancipation to others.

As a matter of fact the life of Athenian women bordered upon

---

[15] T. Woody: *Philostratos: Concerning Gymnastics*, Ch. 27. Reprinted from THE RESEARCH QUARTERLY (May, 1936), VII: 2.

[16] *Lives*, III, 37-38.

[17] *Ibid.*, IV, 35-36.

[18] *Ibid.*, IV, 38.

[19] *Politica*, Bk. II, 9. (Tr. by B. Jowett, in the *Works of Aristotle*, vol. X. Clarendon Press: Oxford, 1921); compare Müller: *op. cit.*, II, 298 *f.*

oriental seclusion. They neither participated in the education, nor in the social, intellectual, and political life of men; they were completely lacking in independence—perpetual minors.[20] Though they did take part in religious celebrations, attended tragic performances in the theatre (but not comedies), went shopping occasionally, and, if unmarried, marched in the Panathenian Procession, they were not permitted to attend the banquets of men, nor to view the greatest athletic festival held at Olympia. Lawton sums up by saying: "Woman was to them an inferior, indispensable indeed, but only as the bearer of the man-child. The wife was not even a sharer in the lighter diversions of men. To the banquet came only the despised flute-players, and dancing-girls, the playthings and the property of men. The true social club was the gymnasium or youths' palaestra: and here nothing feminine appeared at all."[21] Felton somewhat more hopefully asserts that "purity of manners," "wise administration of the house," and "quiet and modest demeanor" were the chief female virtues at Athens; women, though not so prominent as in Dorian communities, were "happy, respectable, and powerful in the sphere of domestic life"; and their education, though not intellectual, imbued their minds "with the spirit of the national poetry, religion, and even the fine arts"; while "experience of life" prepared her to be "the wise companion of man."[22]

There came a time, of course, when a few women at Athens were cultivated. But Athenian women were not famous. Lesbos, where some of the simplicity of Homeric times may have survived, and with it some of the dignity of Homeric women, produced a Sappho; Thebes, an Erinna and a Corrinna; Diotima, Socrates says, taught him the "theory of love"; Aspasia of Miletus, first concubine and later, wife of Pericles, is said to have drawn a brilliant circle of men and women around her and to have taught Socrates rhetoric; but it is quite probable that neither her mind nor her morals were as exceptional as they were popularly credited with being. And at any rate, the bright mind of Pericles, though he delighted in her, seems to have held to the old Athenian ideal for women in general. Thus, Thucydides[23] puts in his mouth praise of "the natural character that belongs" to women; and for the greatness of those who are "least talked of amongst the men, either for good or evil."

There are numerous poetic allusions which seem to harmonize with what is known of the actual condition of subjection of Greek women, and reflect the popular ideas concerning them. In the beginning, one recalls that the Greek, as well as the Hebrew, story of creation, traced the infelicity of man's lot and his inglorious fall to a woman, Pandora.

---

[20] W. A. Becker: *Charicles*, 464. (Tr. by F. Metcalfe. Appleton: New York, 1866.)
[21] W. C. Lawton: *Classical Greek Literature*, 148. (Scribner's: New York, 1903.)
[22] C. C. Felton: *Ancient and Modern Greece*, I, 432-433. (2 vols. Ticknor and Fields: Boston, 1867.)
[23] II, 45. (Tr. by H. Dale. 2 vols. Bell & Sons: London, 1912.)

To this "beautiful evil," Zeus and his divine assistants gave wiles, beauty, desire, skill in domestic work, and a canine mind.[24] Yet Hesiod admits that there is "no nobler prize than a woman, if she be good . . ."; and, again, "nought else worse than a bad one." "Buy thou a woman, not wed her, than she may follow the oxen,"[25] is the utilitarian philosophy of Hesiod; a house, an ox, and a woman appear to be on the same plane; and, again, he warns, trust not the coaxing woman—"She is after thy barn." "I hate the gadding woman," says Theognis; and a later artist makes the visitor inquire in consternation of the husband whose wife has gone out of the house, "Great Zeus! What has she to do out?" In Syracuse, a law forbade a free matron to go abroad after sunset, lest she thereby confess herself an adulteress; and, in day time, she must be accompanied by one maid, at least, and have permission of the Supervisor of Women besides.[26] Solon's law was to the same effect.[27] In *Lysistrata*[28] Calonice opines: " 'Tis hard, you know, for women to get out"; for one must mind a husband, another wake her servant, another put the child to sleep, one wash him, and another "give him pap."[29] Simonides of Amorgos seems to have been faithful to the Hesiodic pattern of ideas in his sarcastic, cynical classification of female natures as like swine, the fox, the dog, mud, salt water, the donkey, the weasel, the mare, the monkey, and, a few only, like bees, who are capable and industrious.

Woman's lot may have been one of subjection, but men were able to see plenty of evil in their own position. Hipponax asserts cynically that a man has only two happy days with his wife; the day he marries and the day he buries her. Euripidean Jason is made to lament:

> Would that mortals otherwhere
> Might get them offspring, and there were no women:
> For then there were no ills among mankind.[30]

Poseidippos later pours out a pessimistic view of life:

> Dost thou wed? Not free
> From worry shalt thou live. Unwedded? Nay,
> Still lonelier is thy lot. Children are burdens,
> Yet without offspring crippled is thy life.[31]

But, after all, though "no one is happy among mortal men," the Athenian loved life, and was apt to hold with Euripides' Iphigenia that

---

[24] J. A. Symonds: *Studies of the Greek Poets*, I, 168 *f.* (Harper's: New York, n.d.)
[25] Lawton: *op. cit.*, 64; this may be a later interpolation—W. C. Lawton: *The Successors of Homer*, 66 *f.* (Macmillan: New York, 1898.)
[26] *Athenaeus*, XII, 521. (Tr. by C. B. Gulick. 7 vols. Heinemann: London, 1933.)
[27] Plutarch: *Lives*, I, 189.
[28] L. 16.
[29] *Ibid.*, 17-19.
[30] W. C. Lawton: *Three Dramas of Euripides*, 134. (Houghton Mifflin: Boston, 1889.)
[31] W. C. Lawton: *The Soul of the Anthology*, 146. (Yale University Press: New Haven, 1923.)

"The sorriest life is better than the noblest death."[32] Even Poseidippos can see life (and also marriage) optimistically; if he only puts his mind to it!

> Art wedded? So
> Thy race abides on earth. Unmarried? Then
> Thy lot is easier. Children bring delight,
> Care free is childlessness.[33]

Were women pained at their lot of subjection? Most of them probably accepted it as a natural and pleasant condition of dependence; but those who became educated doubtless understood better the deprivations of their sisters. If it be true that Sophocles and Euripides draw women according to life, then there were women who had come to understand the meaning of subjection. Probably this came about through the education of some women, the views propagated by certain philosophers, economic changes that gave greater independence to women, and the general decay of patriarchal society which created one the master of the house and the rest his slaves or servants. Certainly, as Mahaffy says, there occurred "a general stir about the position of women." Sophocles expresses a note of revolt in the lament of women in *Tereus:* "We women are nothing;—happy indeed is our childhood, for *then* we are thoughtless; but when we attain maidenhood, lo! we are driven away from our homes, sold as merchandise, and compelled to marry and say 'All's well.' "[34] And Euripidean Medea echoes:

> Of all created things endowed with soul
> And sense, we women are the wretchedest.[35]

It scarcely need be pointed out that *Lysistrata* and the *Ecclesiazusae,* though they ridicule the idea of women's independence, depended for their popularity upon the existence of an audience already acquainted with the disturbing question.

Marriage was generally arranged by parents for reasons of convenience, rather than romance, and was consummated with much ceremony. The best marriageable age for girls was from sixteen to twenty, though marriage was often earlier. Divorce was easy for men, and, under certain circumstances, compulsory. For women it was more difficult, and less common, though they could for unfaithfulness and harsh treatment leave their husbands and return with their property to the care of their father or nearest male relative. Concubinage was common: women continued to be sold "into slavery and concubinage" when the custom of disposing of Greek males as slaves had fallen into disuse.

---

[32] Webb's translation, as quoted by J. P. Mahaffy: *Social Life in Greece,* 204. (Macmillan: London, 1913.)

[33] Lawton: *Anthology,* 147.

[34] Quoted by W. S. Davis: *A Day in Old Athens,* 36. (Allyn, Bacon: New York, 1914.)

[35] Lawton: *Three Dramas of Euripides,* 119.

The work of women varied, of course, with their station in life and with the stage of social advancement. Under the rather primitive, barbaric conditions of Homeric society, women of noble birth are seen serving in many capacities. In fact, work cannot make men or women ignoble. Washing, baking, grinding, weaving, and embroidery are prominent among their employments. Penelope weaves all day and unravels her web at night. In the rustic family, Hesiod, who believes in appointed times for every task, fixes a day for weaving:

> On this let careful woman's nimble hand
> Throw first the shuttle and the web expand.[36]

In time, women of rich families came to do little work, depended on slaves, and assumed a parasitic role in the family. But theoretically, if not in reality, the woman either did the work of the "inside" or directed the servants to do it. In this domestic domain her power was rather complete, though she was, in general, as Xenophon would have us believe, to be instructed at marriage by her husband. And she in turn became the instructor of her children, the boys till of proper age for the *palaestra;* and the girls until their marriage. Training for any profession, such as medicine, was of course impossible; though there is the exception of Agnodice who contrived to get by stealth sufficient knowledge of diseases and remedies, and built up a large practice among women. The profession of skilled entertainer, as musicians, jugglers, dancers, acrobats, seems alone to have been open to girls. Socrates marveled at the skill of the dancing girls, and was impressed by the fact that even girls could learn courage—and dared to throw themselves through naked swords which no man present dared to do.[37] Representations of numerous even more difficult feats have been left to us by artists: women juggling balls; shooting the bow and arrow with feet swung forward over the head while they stand upon their hands; walking on the hands while dipping wine to fill a goblet from an amphora with the feet swung forward over the head.[38]

In what has been said, it must be understood of course that this rule of seclusion and the tendency to parasitism pertained most fully to the women of families in better circumstances. The wives and daughters of the poor were, naturally, not able to afford the seclusion of the rich. In their homes great household industries developed. The necessity for their labor contributed something to their greater freedom. But, in general, neither for women of high nor low estate was there freedom for intellectual, social, moral development such as the free man enjoyed.

---

[36] J. Davies: *Hesiod and Theognis,* 53. (Lippincott: Philadelphia, 1873.)
[37] Xenophon: *Symposium,* II, 11-14. (Tr. with the *Apology* by O. J. Todd, Heinemann: London, 1922.)
[38] Becker: *op. cit.,* Scene VI; A. Baumeister: *Denkmäler des Klassischen Altertums* I, 249, 585. (3 vols. Oldenburg: München und Leipzig, 1885-1888.)

As the chief end in life was to hold their husband's favor, Athenian women of birth and wealth spent much labor upon their persons. The toilette of a real beauty might well occupy the entire morning. But the details of dress need occupy our attention only briefly, it being sufficient to observe that, though health was probably less hindered by their clothing than by the dress of modern women (though this has been improved) the costumes of Athenian women were by no means as conformable to the best interests of health and the design of nature as were those of the simpler, more primitive Laconian damsels. For private wealth laid upon them that possessed it, not only the opportunity but the necessity for, and established the habit of, conspicuous, ostentatious consumption of goods, even to the point of becoming a burden to one's self. Athenian women, kept by their wealthy masters, in contrast to the free Spartan women, were thoroughly covered and veiled; dresses made of over-generous material trailed the ground; high cork heels and thick soles added a bit to the height of some who thought themselves too short;[39] and there were others who deviated so far from the easy grace of loose-flowing draperies, usually associated with classic Greek dress, as to resort to bustles and lacings in order to improve upon the design of nature.

The education of Athenian girls was in character with the social isolation of women. Their instruction, till marriage, was wholly in the hands of the mother or nurse—an apprenticeship to household tasks, such as spinning, weaving, and baking—the future employments of female hands. Though some may have gained a little knowledge of letters, there were no learned women at Athens—outside the circles of *hetairai*. It is perhaps significant that Plutarch cites no Attic models of female virtue. In the *Oeconomicus,* Xenophon has painted a classic picture of the traditional Athenian wife's education. Married before she was fifteen, having seen, heard, and said as little as possible, she had been brought up by her mother to control her appetite, to turn out a cloak if given wool, and above all things to be discreet. The rest of her education comes from her husband, after marriage. She learns about what she, the "queen bee," can do toward the improvement of their property; the bearing and rearing of children, that they may not want for support in their old age; the making of bread; the manufacture of clothes; the training of maids, that they may be doubled in value to the household; having a place for everything and everything in its place; and to be a guardian to enforce the laws laid down for the good government of their household. In short, she learns that hers are the in-door tasks to which the gods "from the first adapted the woman's nature";[40] and, it is to be inferred that she was able to see

[39] Xenophon: *Oeconomicus,* X, 2. (Tr. with *Memorabilia,* by E. C. Marchant, Heinemann: London, 1923.)
[40] *Oeconomicus,* VII, 22*ff*.

eye to eye with Ischomachus who worshipped the "beauty in the order even of pots and pans set out in neat array. . . ." Finally, it may be added, she gave evidence of that highest virtue of "instant obedience" to her master's word.[41]

Between this portrait of feminine education at Athens and that of girls in contemporary Sparta there is no common ground. For such equality as existed between men and women in primitive society had passed away. Mythical Atalanta might participate in the boar hunt;[42] she might be victorious in a race with youths, though finally overcome by Hippomenes;[43] and female deities might strive mightily in the hunt and other physical human activities; but Athenian girls took no part in the sports of mythical times, nor did they share in physical exercises as did Spartan damsels. Becker[44] does refer to the statement of Phintys, which comes to us through Stobaeus, which recommended walking, instead of rouge, to improve the complexion. Such authority carries little weight, however, seeming to be a personal suggestion rather than a description of practice. The utmost exercise recommended by Ischomachus to his wife, so that she might be "really beautiful" is that which comes from moving about superintending the work of the maids—to "give her a walk as well as occupation"; and he also urges on her the excellent exercise of mixing flour, kneading dough, shaking and folding cloaks and bed-clothes, all of which will give her appetite, better her health, and lend "natural colour to her cheeks."[45] Of course, it is obvious from certain artistic representations that this exercise derived from normal activities of the household was supplemented on occasion, or relieved as the case might be, by swinging, wielding the maternal slipper, playing with balls, knuckle-bones, dolls, pet animals, and by indulging in a game of *morra,* or of draughts.

## V

Whether at home or at Olympia, seat of the greatest festival, which brought together Greeks of every land, women faced certain discriminations. A strict law imposed the penalty of death on married women who attempted to witness the Olympian games, or even to cross the River Alphaeus on forbidden days. Whether the restriction applied also to virgins has been disputed. Pausanias says, indeed, that they were not hindered from observing the contests,[46] but this is held by many to be at least open to question.[47] Two definite exceptions to the restric-

[41] *Ibid.*, X, 1.
[42] Ovid: *Metamorphoses,* VIII, 379 *ff.* (Tr. by J. F. Miller, 2 vols. Heinemann: London, 1916.)
[43] *Ibid.*, X, 560 *ff.*
[44] *Op. cit.*, 469.
[45] *Oeconomicus,* X, 10-11.
[46] VI, 20, 9.
[47] J. H. Krause: *Olympia oder Dorstellung des grossen Olympischen Spiels,* 54 *ff.* (Beck: Wien, 1838); P. Gardner: *New Chapters in Greek History,* 275. (Putnam's:

tion against women may be noted: the Priestess of Demeter Chamyne, a woman designated by the Eleans, who sat on a white altar opposite the Hellanodicae and witnessed the contests;[48] and Pherenike of Rhodes, daughter of Diagoras, the boxer. Pherenike was the only woman who transgressed the law and yet escaped punishment. Her husband being dead, she disguised herself as a trainer and came with her son, Peisidorus, to the contests. When he was victorious, she became excited, leaped over the barrier which marked the space reserved for trainers, and in so doing exposed herself and betrayed her sex. Notwithstanding the seriousness of her crime, she was exempted from the punishment of being thrown from the Typaean rock, solely because of the great renown of her family which had furnished many Olympic victors.[49]

The prohibition against women at the Olympian games may be accounted for as a survival of an ancient religious taboo, antecedent to Dorian dominion. It was, in any case, out of keeping with Dorian practice in Lacedaemon and in other Dorian cities such as Cyrene,[50] though it harmonized with Athenian discrimination against women.

A concession to women of wealth and rank was made, in that they were free to enter horses and chariots at Olympia, but of course did not themselves enter the contest.[51] The women who took advantage of the opportunity were chiefly Lacedaemonians. Cynisca, daughter of Archidamus, was the first and the most famous woman who won a victory in the four-horse chariot race at Olympia.[52] A shrine was erected in her honor at the Plane Tree Grove,[53] and a memorial in stone of chariot, horses, charioteer, and a likeness of Cynisca herself, was put up at Olympia.[54] Xenophon says that Agesilaus, her brother, advised Cynisca to enter her horses at Olympia, and proved that victory in such matters showed that the winner was a person of wealth "but not necessarily of merit."[55] Euryleonis was also a winner with a two-horse chariot at Olympia, at an unknown date.[56] Macedonian women, among whom the name of Belistiche appears as a winner in the 128th Olympiad,[57] also followed the Dorian fashion, when the

New York, 1892); E. N. Gardiner: *Greek Athletic Sports and Festivals*, 47. (Macmillan: London, 1910); W. W. Hyde: *Olympic Victor Monuments and Greek Athletic Art*, 49. (Carnegie Institution: Washington, 1921.) Pausanias says, too, regarding the altar of Zeus, that maidens might ascend to a certain point, and women as well "when they are not excluded from Olympia," *i.e.* when contests were not being held.—*Pausanias*, V, 13, 10.

[48] *Pausanias*, VI, 20. 9.
[49] *Ibid.*, V, 6, 7-8; Woody: *Philostratos*, 17.
[50] Krause: *Olympia*, 214.
[51] *Ibid.*, 316.
[52] *Pausanias*, III, 8. 1; Krause: *Olympia*, 316.
[53] *Pausanias*, III, 15. 1.
[54] *Ibid.*, VI, 1. 6.
[55] *Agesilaus*, IX, 6. (*Xenophon Scripta Minora*. Tr. by E. C. Marchant, Heinemann: London, 1925.)
[56] *Pausanias*, III. 17. 6; Krause: *Olympia*, 287.
[57] *Pausanias*, V, 8. 11; Krause: *Olympia*, 57, 258.

northerners began to outdo the Greeks to prove that they were Greek. Berenike Euergetes, wife of Ptolemy III, is also mentioned as an Olympian winner.

Though excluded from witnessing the contests in honor of Olympian Zeus, the female sex were represented at Olympia by a festival of their own, athletic and religious in character, in honor of Hera. Her temple, of wood, stone and sun-dried brick, more ancient than any other whose foundations remain at Olympia, is believed to date back at least to the tenth or eleventh century.[58] Like the men's contests, the festival in honor of Hera was traced back in legend to great antiquity, Hippodamia being credited with its institution in thankfulness for her marriage with Pelops. Two choruses, the Physcoa and the Hippodamia, were provided under the direction of sixteen women, representing originally, it was said, sixteen ancient cities of Elis. The same matrons wove a robe for Hera every four years, and, with their assistants, conducted the Heraean games, in which only virgins of three age-groups participated. These girls, with hair hanging down, dressed in a short shirt leaving the right shoulder bare to the breast, and reaching a little above the knees, ran a course about one-sixth less than the length of the Olympian stadium. The winners were crowned with wild-olive, received a share of the sacrificial cow, and were permitted to place their personal pictures in Hera's temple.[59] Whether the marble statue of a girl runner, in the Vatican Museum, should be referred to the Heraean contests at Olympia, as many have thought, is open to question.[60]

## VI

Greek thought ultimately went far beyond this practiced neglect of women's education. Between the time of Pericles and the days of Plato, there is to be observed certain agitation of mind over the woman question—a growing awareness of the ability of women, and a changed notion of their role in society. The idea of woman's equality with men came to be accepted by some (theoretically, if not actually) and with it, of course, the idea of common education, mental and physical. Thus Socrates, whose views may have been the determining influence in shaping Plato's theory of women in his ideal state, gave expression to the idea of equality of ability, and educability, when, having observed the proficiency of one of the dancing girls, he said: "This girl's feat, gentlemen, is only one of many proofs that woman's nature is really not a whit inferior to man's, except in its lack of judgment and physical strength, so if any one of you has a wife, let him confidently set about teaching her whatever he would like to have her know."[61]

---

[58] Hyde: *Olympic Victor Monuments*, 16; Gardner: *New Chapters*, 283.
[59] *Pausanias*, V, 16; Hyde: *Olympic Victor Monuments*, 49.
[60] Hyde: *Op. cit.*, 50.
[61] Xenophon: *Symposium*, II, 9.

Plato makes more specific his idea of equal capacities and of woman's destiny for many positions of social utility. For some are gifted in healing, others in music; some are inclined to gymnastics and warlike exercises, others to philosophy. "Men and women alike possess the qualities which make a guardian," though they may differ in degree of strength or weakness.[62] Since they are possessed of the same natures, and like natures should have the same pursuits, it is concluded that music and gymnastics are both proper elements in the education of all members of the guardian class, whether male or female; despite the fact that it is urged that women, especially old ones, will be thought ridiculous when they exercise naked with men at the gymnasium.[63] It is significant that Plato defied Athenian custom and admitted women to his Academy. Diogenes Laertius informs us that Lastheneia of Mantinea and Axiothea of Phlius were among his disciples, and were reported "to have worn men's clothes."[64]

But the judgment of Greek philosophers was generally unfavorable to the emancipation of women from subjection. Having declared that slavery is justified in society, since its basis is in nature itself, Aristotle went on to explain that women were fitted by nature for subjection to men, since they had no faculty for self-rule or direction.[65] For the virtue of a woman, he held, contrary to Plato, is not the same as man's; hers lies "in obeying," and that of a man "in commanding."[66] In general, he held that throughout the animal kingdom, though the female has some qualities more strongly developed than the male, she is less complete, less courageous, weaker, more impulsive, and the "differentiation is the most obvious in the case of humankind. . . ."[67]

Thus Aristotle, with all the weight of his reputation as the master of them that know, was to be quoted down through the ages as a witness to her inferiority. Though, with the rise of the modern scientific movement, scholars began to question certain views of the master, they clung tenaciously to his *dicta* regarding the inferiority of woman's mental capacities. Not till the nineteenth and twentieth centuries did a changed industrial world, a novel conception of man and society, a pragmatic test in schools of various sorts, and the more exact procedures of a new psychology combine their influence to break, in some degree, the authority of prejudicial custom and the magic power of persuasive words.

---

62 *Republic*, V, 456. (Tr. by B. Jowett: *The Dialogues of Plato*. 5 vols. Oxford University Press: London, 1892.)

63 *Ibid.*, 452, 456.

64 *Diogenes Laertius*, III, 46. (Tr. by R. D. Hicks. 2 vols. Heinemann: London, 1925.)

65 *Politica*, I, 5.

66 *Ibid.*, I, 13.

67 *Hist. Animalium*, IX, 1. (Tr. by D. W. Thompson. Clarendon Press: Oxford, 1910.)

# Vital Capacity in Trunk Deformities

By K. G. Hansson, M.D.
*New York City*

THE relation between posture and health has long been a puzzling one. We like to believe that good position of the body goes with good health. But we have very little scientific data to base our presumption on. I am certain that we have all seen people with marked deficiency in body make-up and in body function apparently enjoying very good health, and we have also seen people with apparently good body mechanics who seem below the average in health. This ought to put us on guard against the evaluation of a person's health from the appearance of his body. Far more important than the appearance of the body is the function of organs inside the body. Perfection is reached when the organs function well inside a faultless body. Many years ago I was struck by the great number of severe deformities in children and the relatively few among adults as seen in a large orthopedic clinic. I became interested in these observations in 1926, and it was evident that the mortality among the children with trunk deformities was rather high. I began to look around for some measurement of the children's health, and happened to read an article by Dr. May Wilson on the vital capacity in cardiac children. Vital capacity was used for prognosticating the cardiac function. I became interested in the vital capacity of the lungs and I have carried on this work for twelve years at the Hospital for the Ruptured and Crippled.

By vital capacity we mean the volume of air that can be expelled from the lungs after a full inspiration. The study of respiration started after Harvey had published his work on the circulation of the blood in 1628. First scientific investigation of vital capacity was published by John Hutchinson in 1846. At one time Georges Dreyer in England and Schneider in the United States made use of vital capacity determinations on candidates for the aviation corps. To those of you interested, I recommend Dr. J. A. Myers' *Vital Capacity of the Lungs*, published by Williams and Wilkins Co., 1925.

There are several factors which affect the vital capacity of the lungs in healthy individuals. Extensive physical training may result in overdevelopment of the vital capacity, while certain sedentary occupations may decrease it. Vital capacity appears to be low in obese persons, in the female, in the recumbent position, and among colored people and the Chinese.

The influence of disease on vital capacity has been carefully studied.

A paper presented before the Eastern District Association, April 1938, Atlantic City.

It has been found of clinical significance in cardiac disease, hyperthyroidism, emphysema, asthma, pleurisy, pneumothorax, pulmonary abscess, new growths, pneumonia, and pulmonary tuberculosis. It is most valuable in cardiac disease and pulmonary tuberculosis where the vital capacity determines the severity of the lesion, helps to detect beginning complications, and guides the prognosis.

In going over the literature I found that such men as Schulthess, Lorenz, Saxl, Bauner, and others had suspected that trunk deformities impair heart and lungs, but they presented no evidence.

Yates, in *Archives of Surgery*, January 1926, says that resistance, growth, and repair of the interthoracic structure is definitely related to the vital capacity.

Flagstad and Kollman in *Journal of Bone and Joint Surgery*, October 1928, reported a study of vital capacity in one hundred cases of scoliosis. Their conclusions were:

1. That a curve in the dorsal region had little effect on the vital capacity.
2. That plaster jackets reduced vital capacity 14 per cent.
3. That reduction of vital capacity was due to embarrassment of heart and lungs and reduced mobility of the diaphragm.
4. That vital capacity gives an index of damage done, and should be determined before operative work in thoracic and abdominal surgery.

## CALCULATION OF VITAL CAPACITY

It is evident that the surface area of the lungs is responsible to a certain extent for the vital capacity. The lung surface area has a definite relation to the body surface area, and DuBois has shown that the body surface can easily be calculated if you know the standing height and weight of a patient. This body surface calculated from DuBois formula is expressed in square meters.

We use the ordinary water spirometer and take three readings of each patient. The average of these three readings is used. With the spirometer reading and the body surface, the vital capacity is calculated from May Wilson's formula, which gives the percentage of normal vital capacity. In order to check up this procedure, thirty-eight normal persons were tested and they all gave a vital capacity of normal or above normal.

## THE VITAL CAPACITY IN 1,005 PATIENTS WITH TRUNK DEFORMITIES

For practical purposes, it is convenient to divide these patients into two groups: in on group we include the scoliosis patients; i.e., those with lateral curvatures, and in the other group the patients with antero-posterior curvatures:

| Per cent vital capacity | –39 | 40–49 | 50–59 | 60–69 | 70–79 | 80–89 | 90–99 | 100–109 | 110–120 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Scoliosis | | | | | | | | | | |
| Functional | 43 | 67 | 76 | 74 | 78 | 49 | 33 | 16 | 6 | |
| Paralytic | 7 | 14 | 8 | 9 | 4 | 1 | | 1 | | |
| Rachitic | 3 | 4 | 2 | 3 | 1 | 3 | 2 | | | |
| Congenital | 4 | | 5 | 2 | 7 | | 22 | 1 | | |
| Epiphysitis | 4 | 2 | 5 | 9 | 9 | 1 | 6 | 3 | | |
| | 61 | 87 | 96 | 97 | 99 | 54 | 43 | 21 | —564 | incl. 6 |
| Postural Defects | 29 | 55 | 78 | 69 | 74 | 46 | 39 | 33 | 18 | —441 |
| Total | 90 | 142 | 174 | 166 | 173 | 100 | 82 | 54 | 24 | |

We had 564 patients with scoliosis and 441 with anteroposterior curves.

If we analyze the figures above, we find that among the scoliosis patients, 537 or 95.2 per cent had a vital capacity below normal. Of these subnormal capacities, we find 26.2 per cent less than half of normal. As should be expected, we find the paralytic type of scoliosis with very low vital capacity. Of these, 47.7 per cent had vital capacity of less than half of normal.

The poor posture group shows 88.4 per cent of patients with a vital capacity of less than half of the normal one. This is very surprising and should have more attention. Since computing these figures, I have added an equal number of observations so that today I have the vital capacity reading of about two thousand children with deformities of the trunk. When I tell you that all these children are also photographed in four positions at least every six months, you can understand the enormous amount of work these figures represent.

The next question to be answered is "Of what use are all these statistics?" I will try to answer this under three headings.

What is the significance of a low vital capacity?

What can be done about it?

What value is it to physical education?

The *significance* of a low vital capacity is undoubtedly related to the general health of the patient. Healthy persons with normal bodies have a normal vital capacity, which was the result of my investigation of 38 normal individuals. Previous investigators have suspected that trunk deformities, especially scoliosis, embarrass the general health of the patient and that this resulted in a lowered vital capacity. Flagstad and Kollman concluded that the reduction in vital capacity was due to embarrassment of heart and lungs and reduced mobility of the diaphragm. Vital capacity records are very useful in cardiac children, and used as a

criterion for their activities and as a basis for prognosis. I have seen a patient with arthritic ankylosis of spine and ribs, with a very low vital capacity, die from air hunger while undergoing hyperpyrexia or fever treatment. I also recall a patient with paralytic scoliosis and vital capacity of 37 per cent who caught a cold on a Friday, developed pneumonia on Saturday, and died on Sunday. This is only one example of many to show how little resistance these patients have when stricken by a disease that taxes their heart and lungs.

In an orthopedic hospital such as the Hospital for the Ruptured and Crippled in New York City, we encounter a very great number of children with trunk deformities. At one time I had 600 clinic children in the corrective gymnasium. By far the greater majority came from the less privileged classes in Manhattan. Private patients with marked trunk deformities are relatively rare. Dr. Cobb of our hospital is investigating the blood chemistry of all the scoliosis patients and he tells me that they usually show a low creatinine content. This would indicate poor muscle metabolism due to poor diet.

I have extended my vital capacity study to patients with rheumatoid arthritis. These patients consistently have low vital capacities. There is also evidence for the fact that a reduced vital capacity goes hand in hand with poor aeration of the lungs. This means a low oxygen content of the blood, and also a low supply of oxygen to the cell metabolism. Furthermore, an abnormally low vital capacity means a small excursion of the diaphragm, which is an important factor of the return circulation in the *vena cava* and the venous return circulation as a whole.

What can we *do* with a low vital capacity?

I have followed some of these children over long periods, i.e., three to six years, and I have always been impressed by the parallel improvement in appearance as shown by the photographs and the gradually increasing vital capacity. This has been accomplished by a combination of rest, proper nutrition, and therapeutic exercises. In the therapeutic exercises it is important to consider the patient as a complete individual and not as a curvature of the spine. It is well to know what type of curve we are dealing with, but also to remember that this curve is part of a spine, which is part of a human torso, which is part of a human body as a whole. If we proceed from this basis, we must properly align the whole body mechanics. The head must be well balanced, the normal curves of the spine encouraged, and the shoulders and upper extremities kept in best possible position for their functional activity. The pelvis should be maintained in the best position of support for structures above it, for protection of the pelvic organs, and for attachment of the powerful walking muscles below.

Hips, knees, and feet must be properly balanced for their best functional activity. This proper alignment of the body mechanics can be

accomplished in various ways. The most scientific approach is probably through the primitive posture reflexes. In addition to the general reconstruction of body mechanics, we have general body activities, games for young children, and sports for adolescent children.

Finally, we must consider the specific corrective exercises which should be concentrated on the diaphragm and the thoracic cage.

Plaster jackets and various braces for support are detrimental to the general health of a child as determined by the vital capacity and should only be used when definitely indicated as a necessity for structural support.

## VALUE OF VITAL CAPACITY IN PHYSICAL EDUCATION

In conclusion may I draw your attention to the importance of some records for measuring a child's health. If you have some reliable records which prove what you are accomplishing, I believe the system used to obtain the desired result is of secondary importance. In physical education, I believe an enormous amount of work has been laid down for the rational understanding and treatment of the human body mechanics. I may be wrong, but it seems that in my short life I have passed through four distinct approaches to body mechanics. First we had the muscular theory, which is still predominant in most commercial gymnasiums. Second, we had the skeletal approach as advocated by Goldthwaite and much utilized in orthopedics. Third, I would like to speak of the neurological theory as demonstrated so well by Dr. Haynes, which is based on primitive posture reflexes. Finally, I believe we are at present exposed to the psychological approach which is of great interest and should lead to new fields of study and treatment of a most fascinating field. I refer to the work of Miss Todd and Miss Sweigard.

I repeat that these various approaches probably all have their good points, and I believe that there is more than one road to success. May I suggest that you, members of the physical education profession, include vital capacity studies in your records and thereby add an objective measurement of your very important work on the growing generation.

## SUMMARY

I. I believe that in the vital capacity determination we have an objective record of a child's health as far as heart and lungs are concerned.

II. It appears from my study of our two thousand children with trunk deformities that the deformity usually affects the child's general health and that the vital capacity can be used as prognosis as well as a check on the result of treatment.

III. Improvement in the deformity goes hand in hand with an improved vital capacity.

IV. Nutrition, rest, and exercise are equally important in the treatment of patients with trunk deformities and low vital capacity.

## REFERENCES

Du Bois, B.S., Delafield, and Eugene F. Du Bois, "The Measurements of the Surface Area of a Man," *The Archives of Internal Medicine* (May 1915) 868-881.

Wilson, May G., and Dagton J. Edwards, "Diagnostic Value of Determining Vital Capacity of Lungs in Children," *Journal of American Medical Association,* 78 (1922) 1107.

Myers, J. A., *Vital Capacity of the Lungs,* (Baltimore: The Williams and Wilkins Company, 1925).

# A Study of the Content of Professional Courses in Physical Education

By Tom Scott

*Associate Professor of Physical Education*
*Central Missouri State Teachers College*
*Warrensburg, Missouri*

THE scientific selection of materials to be included in professional courses in physical education is a problem that is confronting the many teacher-training institutions today. Obviously, there are many bases that may be used in selecting the content of these courses.

It was the purpose of this study to investigate two of these bases, namely, the time spent by teachers in the field in performance of administrative and teaching duties, and the subjective opinion of these same teachers as to the importance of professional training in the duties involved.

These two bases would appear to be most worthy of consideration as aids in the matter of selecting the content of the professional courses in physical education. Training should be directly related to the duties that the teacher-to-be will be called upon to perform when he gets out into the field. Furthermore, no one would appear to be in a better position than the teacher in the field to judge as to the relative importance of professional training in the activities he is called upon daily to perform.

The question as to their worth as bases for evaluating the content of the professional courses has never been really established, however, and as stated above it was the purpose of this investigation to study them through scientific procedure.

## PROCEDURE

The first step in this investigation involved the construction of a check list of seventy activities relative to the administrative and teaching duties of physical education teachers. The check list was sent to two hundred fifty high school men physical education teachers. They were asked to check:

1. The activities according to the amount of time they spent (none, little, considerable, great amount) in performing their duties as physical education teachers.

2. The activities according to their importance (none, little, considerable, great) in professional training.

A paper presented before the Central District Association, April 1938, Minneapolis.

3. The activities in which they had received their college training.

A total of one hundred questionnaires was returned, and master sheets were developed to compile the data. These totals were expressed in terms of percentages of those reporting as to (1) time spent in the activity, (2) importance of professional training in the activity, and (3) those having college training in the activities.

Tables were then constructed to indicate the following:

1. Time spent in performing administrative duties.
2. Opinion as to importance of professional training in the activities.
3. Time spent in the performance of teaching duties.
4. Opinion as to importance of professional training in teaching duties.
5. The ranking of the administrative activities as the result of considering the time spent in their performance and the subjective opinion of those reporting as to the importance of professional training in the same.
6. The ranking of the teaching activities as a result of considering the time spent in their performance and the subjective opinion of those reporting as to the importance of professional training in the same.

In the construction of these tables, consideration was given only to the tabulations where the teacher had checked in the considerable or great column. It was decided that for purposes of this study the teacher should make an evaluation in terms of none, little, considerable, or great, but that rankings would be based entirely upon the checks recorded in the considerable and great columns.

Correlations were made for purposes of determining, through statistical procedure, the relationship existing between:

1. Time spent in performance of administrative activities and subjective opinion as to importance of professional training in the same.
2. Time spent in administrative activities and the item of previous college training in the activities.
3. Opinion as to importance of professional training in the activities and the experience of college training in the same.
4. Time spent in teaching activities and the experience of college training in the same.
5. Time spent in teaching activities and opinion as to importance of professional training in the same.
6. Opinion as to importance of professional training in teacher's activities and previous experience of college training in the same.

## DISCUSSION OF THE DATA

In Table I of the thesis, administrative activities ranked according to time devoted to the activity showed the following order for the first ten:

Purchase and care of equipment, planning of the curriculum, sched-

ule making (athletic), organization and administration of intramurals, senior high supervision, selecting officials, publicity and advertising, staff administration, construction and maintenance of facilities, financing the program and making grades.

An interesting disclosure of this table is the relatively low correlation found between the time devoted to the activity and the college training of the teachers reporting, namely, .477.

This correlation indicates that the physical education teachers spend most of their time in performing administrative duties in which they have had little or no professional training.

In Table II of the thesis, the physical education teachers ranked the administrative activities according to their opinion as to the importance of professional training in the activity.

Those administrative activities which the teachers ranked among the first ten and in their order are:

Planning of the curriculum, organization and administration of intramurals, senior high school supervision, doing corrective work, providing medical service, junior high supervision, administration of health education, making speeches, purchase and care of equipment, and giving physical examinations.

It is very interesting to note here that the teachers in the field feel that those activities in which they spend most of their time are not the most important in relation to professional training.

Correlations of the rankings of the activities based upon amount of time spent in performing, and the rankings made in terms of opinion as to importance of professional training, resulted in a coefficient of .316, a relatively low one. This finding would appear to indicate the need for considering both of those items in combination, in order to establish a base for determining the content of professional courses in physical education.

The correlation between the importance of professional training and those reporting college training is also interesting. This coefficient is .672 and indicates that there is an important degree of relationship between the opinion of the teachers as to the importance of professional training in the activities and the college training they have had in the same.

In Table III of the thesis (teaching activities ranked according to time devoted to the activity), the following activities ranked among the first ten and in the following order:

Basketball, football, track and field, softball, volleyball, modified games, relays, touch football, tumbling, and calisthenics.

The correlation between the amount of time spent in the activities and previous college training in the activities was .842. This is of considerable importance and suggests that there is a carry-over from

college training in these teaching activities into their own teaching situations.

In Table IV of the thesis (teaching activities ranked according to opinion as to importance of professional training in the activity), the following ranked among the first ten and in this order:

Basketball, football, track and field, hygiene, physiology, swimming, baseball, gymnastics, tennis, and tumbling.

The correlation between the importance of professional training and those reporting previous college training in the activities was .799. This is a significant correlation and indicates that there is a definite relationship between the teachers' opinions as to the importance of professional training and the college training they have received.

The correlation between Table III and IV, namely, time spent in the teaching activities and opinion as to importance of professional training in the activity, is .705. This signifies that there is definite relationship between these two items and indicates that there is nothing to be lost in considering them in combination in the effort to establish bases for evaluating the content of the professional courses in physical education.

However, there is some question as to the value of these factors as a standard to be used in evaluating the content of the professional courses. As indicated by the high degree of correlation found to exist between the items involved, there appears to be a relationship which might make for a stereotyped professional curriculum if these factors are used in determining the content of the courses in question.

In Table V of the thesis, the administrative activities were ranked in regard to the time spent in their performance and the opinion as to importance of professional training in the activity. They are ranked in the following order:

| Activity | Rank | Activity | Rank |
|---|---|---|---|
| Planning the curriculum | 1 | Selecting officials | 14 |
| Organization and administration of intramurals | 2 | Financing the program | 15 |
| Senior high supervision | 3 | Constructing and maintaining facilities | 15 |
| Purchase and care of equipment | 4 | Making speeches | 17 |
| Schedule making (athletic) | 5 | Making grades | 18 |
| Providing medical service | 6 | Testing and classifying pupils | 18 |
| Junior high supervision | 7 | Giving physical examinations | 20 |
| Administration of health education | 8 | Scouting or club work | 21 |
| Staff administration | 8 | Officiating | 22 |
| Publicity and advertising | 8 | Elementary supervision | 23 |
| Choosing and training squad leaders | 11 | Providing awards | 24 |
| Lesson plans | 12 | Office management | 25 |
| Corrective work | 12 | Adult supervision | 26 |

In Table VI of the thesis the same procedure was followed as in the construction of Table V in ranking the teaching activities relative

to their combined rank and the time spent and the importance of professional training. The order of rank for these activities is as follows:

| Activity | Rank | Activity | Rank |
|---|---|---|---|
| Basketball | 1 | Gymnastic dancing | 23 |
| Football | 2 | Wrestling | 24 |
| Track and field | 3 | Six man football | 25 |
| Playground baseball | 4 | Handball | 26 |
| Hygiene | 5 | Ice hockey | 27 |
| Tumbling | 5 | Pyramids | 27 |
| Modified games | 5 | Speedball | 29 |
| Baseball | 5 | Tap dancing | 30 |
| Gymnastics | 9 | Ping pong, tether-ball, etc. | 31 |
| Volleyball | 9 | Marching | 32 |
| Physiology | 11 | Camping | 33 |
| Calisthenics | 11 | Badminton | 33 |
| Tennis | 13 | Clog dancing | 33 |
| Swimming | 14 | Folk dancing | 36 |
| Games of low organization | 14 | Danish gymnastics | 37 |
| Golf | 16 | Archery | 38 |
| Relays | 17 | Social dancing | 38 |
| Apparatus | 18 | Field hockey | 40 |
| Soccer | 19 | Fencing | 41 |
| Touch football | 20 | Natural dancing | 41 |
| Winter sports | 21 | Modern dancing | 43 |
| Boxing | 22 | Canoeing | 44 |

## CONCLUSIONS

1. The results of this study would appear to establish *time spent* and *opinion as to importance of professional training* in administrative activities, considered together, as a most worth-while basis for evaluating the content of the professional courses in physical education.

2. *Time spent* and *opinion as to importance of professional training* in teaching activities, while valuable as bases for evaluating the content of the professional courses in physical education, do not serve as effectively in this area as in that of administration.

3. As the result of using time spent and opinion as to importance of professional training as a basis, planning of the curriculum, organization and administration of intramurals, senior high supervision, purchase and care of equipment, schedule making, providing medical service, junior high supervision, administration or health supervision, and staff administration, in the order listed, should receive much consideration of the teacher-training institutions that are attempting to determine the content of their courses for physical education teachers.

4. Assuming that time spent and opinion as to importance of professional training in teaching activities is a valid basis, the following activities, in the order listed, would appear to deserve a great amount of the time given to preparing the teachers in the duties they will perform when they get out into the field, namely, basketball, football,

track, softball, hygiene, tumbling, modified games, baseball, gymnastics and volleyball.

5. There is a need for rhythmic activities in the training of teachers. Gymnastic and tap dancing received a generous rating, which means that if time spent in teaching and opinion as to importance of professional training in the activity are to be taken as criteria, the teacher in training should be provided ample opportunity to gain skill in this type of activity.

6. Although the present program of physical education is being considered more and more as one of informal activity, this study shows that there is still need for preparing teachers to have training in the types of activity which for years have been considered formal in nature, namely, calisthenics, gymnastics, apparatus, and tumbling.

# A Study of Teaching Difficulties in Physical Education

By Elizabeth Graybeal
*State Teachers College, Duluth, Minnesota*

## THE PROBLEM AND METHOD

THE problem involved in this study is to make a diagnostic chart for use in locating difficulties of teachers of physical education in the elementary schools. The method followed was suggested by that used by Dr. Leo J. Brueckner in "A Curricular Study of Teacher Training in Arithmetic."[1]

Dr. Brueckner states that supervisors can give more definite help to teachers if they know the difficulties that probably will be encountered and the points at which help will be needed. The writer of this paper attempted to locate difficulties of teachers of physical education through an analysis of the literature on method and of actual teaching practice.

The first step consisted of the setting up of objectives of instruction in physical education. A study of the literature shows that emphasis is on five items, the first four of which may be expressed in the words of Jesse Feiring Williams. They are:

1. Development of the organic systems of the individual. All that there is of development, aside from heredity, comes through physical education.

2. Development of the neuromuscular mechanisms providing for fundamental skills. This is a form of safety education although it is not conducted for that reason.

3. Development of the character in relation to social standards and customs. This in essence is moral and social education.

4. Development of a repertoire of recreational activities, characterized by skill above the novice class, and attitudes toward them that will favor strongly their use even in the face of pressing economic or social demands.[2]

5. The development of desirable attitudes towards physical and mental well-being and the acquisition of knowledge to aid in the control of individual and community health.[3]

---

This material has not been copyrighted. It could be improved by anyone desiring to do further work on it.

[1] Leo J. Brueckner, *A Curricular Study of Training in Arithmetic*, (Minneapolis: University of Minnesota Press, 1932) p. 3.

[2] J. F. Williams, *Principles of Physical Education*, (Philadelphia: W. B. Saunders Co., 1938) p. 270.

[3] Committee on Health Problems in Education, National Education Association, Thomas D. Wood, Ed., *Health Education*. (New York City, 1930).

The next step consisted of making an analysis of methods of teaching by which these objectives can be achieved. This analysis was made by a study of the literature on principles and method in physical education; by deriving standards of good teaching from rating forms, check lists, and other supervisory devices which are used in the teacher-training departments of twelve leading colleges and universities; by considering present day educational philosophy and psychology of learning; and by noting the extent to which methods were derived from experimental treatment. The most important items considered in this analysis were:

1. The legitimate interests of pupils as a factor in the selection of subject matter and as a basis of motivation.

2. The necessity of stressing social applications so that pupils will realize the functional values of health knowledge and habits, of skills in recreational activities, and of a well coordinated and controlled body.

3. The need of providing for individual differences in pupils' motor ability, physical efficiency, environmental opportunities, and interests.

4. The contributions that physical education can make in the development of desirable social qualities such as leadership, followership, self-direction, and ability to cooperate.

5. The analysis of habits and skills to be attained and the provision of learning situations to insure their direction.

6. The procedures most likely to secure, according to experimental study and the opinion of experts, an economical, effective use of the time available for the teaching and practice of physical education.

Having derived from the literature in the field and from the supervisory devices used by experts a definite idea of the objectives of teaching physical education, and with a knowledge of the general and specific methods of teaching by which these objectives may be obtained, the third step was taken in preparation of the diagnostic chart. Through the courtesy of Professor Gertrude Baker, supervisor of teacher training in physical education at the University of Minnesota, a list of difficulties encountered by practice teachers was obtained. These were based on needs felt by the practice teachers themselves. Furthermore, Miss Leanore Alway, of the University of Nebraska, contributed a list of difficulties in the organization of ideas, groups, time, and space which she noted while making observations of practice teachers. Finally, the writer observed thirty-six classes in the public schools of Minneapolis, St. Paul, and Duluth, and, keeping in mind the items considered in the above analysis of method, listed the difficulties that were demonstrated. Miss Florence Owens, supervisor of physical education in the elementary schools of Duluth, Miss Margaret Fox, instructor in, and Mr. Luther Case, director, of the teacher-training department of the Duluth State Teachers College checked and approved the list in its present form.

The items are organized under nine headings comparable to those which appear in Dr. Brueckner's chart for diagnosing difficulties in the teaching of arithmetic. Those nine heads are as follows:

I. Background of teaching equipment.

II. Knowledge of specific objectives of physical education.

III. Recognition of the function of general method in the teaching of physical education.

IV. Procedures in presenting new processes.

V. Procedures in diagnosing pupil difficulties and in providing remedial work.

VII. Methods of socializing the work in the class period.

VI. Methods of making work vital and meaningful.

VIII. Use of tests in instruction.

IX. General factors.

## A CHART FOR USE IN HELPING TO LOCATE TEACHING DIFFICULTIES IN PHYSICAL EDUCATION

### I. Background of Teaching Equipment

1. Possessing an enriched background of academic training.
2. Having adequate professional training.
3. Having skill in many motor activities.
4. Knowing social conditions and ways in which physical education can meet social needs.
5. Having an appreciation and understanding of child psychology.
6. Possessing a thorough understanding of the teaching situation and ability to meet it.
7. Knowing reasonable standards of attainment for varying groups.
8. Having an understanding of the experimental method and how to use it for the improvement of teaching.
9. Giving evidence of professional growth.
10. Knowing activities suitable to objectives.
11. Understanding the physical abilities and limitations of different pupils.
12. Having a grasp of subject matter including daily preparation.

### II. Knowledge of Specific Objectives of Physical Education

1. Developing an appreciation of the function of physical education.
2. Developing a spirit of inquiry and endeavor.
3. Developing a sense of relative values.
4. Using materials and processes that have social values.
5. Developing an appreciation for economy and beauty of movement.
6. Developing in pupils a desire to become skillful in and to participate in individual activities.
7. Developing in pupils a desire for participation in group activity.
8. Furnishing opportunity for pupil practice in exercising democratic self-control.
9. Developing standards of fair play and good sportsmanship.
10. Developing a social consciousness through provision for pupil participation in organization and in activities.

11. Developing a sense of and habits of responsibility to others.
12. Providing opportunity for practice in exercising strategic judgment as a source of motor-efficiency.
13. Cultivating an appreciation of rhythm from the standpoint of beauty and efficiency in life.
14. Appreciation of the value of good posture from the standpoint of beauty and efficiency.
15. Knowing the feeling of well-being that comes with a reasonable amount of motor activity.
16. Knowing the direct relationship between physical condition and achievement.
17. Providing for the physiological responses that aid bodily growth and vigor.
18. Cultivation of a safety consciousness in pupils.
19. Building up an ideal of keeping fit as a fundamental life motive with regard to health.
20. Furnishing opportunity in organization for children to have laboratory practice in control of community hygiene.

III. Recognition of the Function of General Method in the Teaching of Physical Education

1. Providing conditions in which the growth of desirable social characteristics, attitudes, and ideals will take place.
2. Enriching and vitalizing the experiences of pupils.
3. Recognizing the possibilities of socializing experiences in the lesson.
4. Using experiences and activities that arise in connection with local conditions and situations.
5. Securing learning situations in which motives of a relatively high order are present.
6. Providing activities that offer opportunity for the pupil to exercise desirable instinct mechanisms.
7. Recognizing the value of desirable emotional reactions to conditions and habits essential to mental and physical health.
8. Recognition of the value of undesirable emotional reactions towards conditions and habits that are detrimental to mental and physical health.
9. Determining instruction by the health practices and motor activities of pupils both in and out of school.
10. Adaptation of instruction to pupils' powers of comprehension.
11. Adaptation of materials of instruction to age and ability levels.
12. Recognizing the value of giving pupils opportunity to participate in the planning and organization of activities.
13. Providing opportunities and stimuli to practice health habits that are pupil initiated.
14. Understanding the teaching situation.
15. Understanding of how to organize material for presentation.
16. Understanding of how to organize space and material for class activities.
17. Realizing the value of obtaining group cooperation.
18. Recognizing abilities of particular groups.

19. Knowing the importance of maintaining the objective.
20. Maintaining proper relationship between major and minor objectives.
21. Connecting objectives with the immediate life of the pupil.
22. Correlating physical education activities with other work of the school.
23. Recognizing the importance of a clear understanding of what he is to do on the part of the pupil.
24. Knowing how to build standards of health into the teaching process.
25. Knowing the necessity of attention to certain routine factors such as heat, light and ventilation.

### IV. Procedures in Presenting New Processes

1. Knowing the steps in the learning process.
2. Showing the social utility of the new step in a process through application.
3. Knowing the suitability of approach.
4. Presenting the proper amount of new material.
5. Using previously acquired skills in presenting new material.
6. Considering special difficulties in new material and providing for adequate practice.
7. Presenting material with enthusiasm.
8. Teaching efficient methods of practice.
9. Using superior pupils in demonstration of new material.
10. Giving adequate assistance to leaders previous to class meeting.
11. Preparing equipment and space before the lesson.
12. Making complete demonstration in presenting new material.
13. Providing for proper progression within the lesson.
14. Giving pupils opportunity to apply new knowledge and skills.
15. Providing for follow-up in subsequent lessons to insure retention of skill.
16. Providing for participation by all pupils including those on the side.
17. Evaluating per cent of participation by pupils.
18. Allowing for proper balance between discussion and activity.
19. Knowing the importance of assuming proper position in relation to class.
20. Knowing when to give aid and when to withhold it.
21. Allowing for pupil appraisal.
22. Generalizing all activities at close of lesson.
23. Adapting language to children and building up in them an activity and health vocabulary.
24. Providing follow-up in health work during succeeding lessons.

### V. Procedures in Diagnosing Pupil Difficulties and Providing Remedial Work

1. Recognizing specific needs of pupils.
2. Knowing the more common faults and weaknesses.
3. Ascertaining cause of lack of interest.
4. Helping pupils to recognize their own difficulties.
5. Using physical examination records to locate causes of deficiencies.

6. Considering the personality of the pupil as a factor.
7. Using graphs to interpret shortcomings.
8. Keeping records of diagnoses.
9. Checking on the pupils' understanding.
10. Providing special help for those pupils for whom class presentation is not adequate.
11. Examining home environment in an effort to help pupils make proper adjustments to group activity.
12. Adjusting class work in such a way that the teacher has time available for giving individual aid in overcoming difficulties.
13. Adjusting standards of achievement to the individual needs.

VI. Methods of Making Work Vital and Meaningful

1. Choosing activities of proper and varying levels of difficulty.
2. Using daily life situations.
3. Showing the life need of processes before teaching them.
4. Selecting activities based on legitimate interests of pupils.
5. Developing in the pupil the purpose to improve.
6. Making pupils conscious of objectives.
7. Developing the consciousness of sensing the correct form in varied skills.
8. Showing the social significance of various skills, habits, attitudes and knowledges.
9. Providing opportunity for participation in activities of special interest to pupils.
10. Distributing opportunity for leadership in class activities.
11. Correlating health work and physical education activities.
12. Providing opportunity for cooperative enterprises.
13. Comparing achievement with that of other classes on the same level.

VII. Methods of Socializing the Work in the Class Period

1. Providing for squad work.
2. Using superior pupils to assist.
3. Considering the social significance of certain activities.
4. Recognizing and providing for varying social abilities.
5. Organizing democratic groups within the class.
6. Providing opportunity for pupils to assist in organizing and planning class and extra-class activities.
7. Encouraging initiative on the part of pupils in planning and leading activities.
8. Encouraging courtesy, unselfishness, and consideration.
9. Arousing interest in the development of habits to the extent that activities will be participated in voluntarily ouside of class.
10. Developing an appreciation of the social significance of certain activities.
11. Developing an appreciation of good sportsmanship in class activities and in daily life.
12. Developing an appreciation of the social significance of practice of health habits.

13. Developing appreciation of the value to the community of the practice of health habits.

## VIII. Use of Tests in Instruction

*A. Athletic Ability Tests.—*

1. Knowing what constitutes a good test.
2. Selecting tests that are suitable to the teaching situation.
3. Giving tests at the beginning, at regular intervals, and at the end of the year.
4. Tabulating individual records of test results.
5. Interpreting test results in the interest of ability grouping.
6. Charting test results.
7. Using test results as a basis of individual or group activity.
8. Filing test results and using them for making comparisons later.
9. Constructing informal tests for use in the absence of standard tests.

*B. Achievement Tests.—*

1. Selecting, constructing, and using informal achievement tests: (*a*) in skills in elements of various sports and games, (*b*) in knowledge of rules of games, (*c*) in knowledge of health practices, (*d*) in desirable traits.
2. Selecting and constructing tests that are interesting to pupils.
3. Tabulating and charting results of tests.
4. Using test results as a means of motivating pupils.
5. Using test results to ascertain progress.
6. Using test results to diagnose pupil difficulties.
7. Using test results to help locate weaknesses in materials and methods of teaching.
8. Using test results as a basis for remedial work for individuals and groups.
9. Considering individual differences in interpreting test results.
10. Using self-testing activities to help pupils to locate own difficulties.

*C. Anthropometric and Health Tests.—*

1. Selecting and using tests that are appropriate for use of individuals in groups.
2. Using test results to make standards clear to pupils.
3. Using care in giving tests to enlist the pupil's interest.
4. Using height-weight graphs to determine the pupil's rate of growth in the interest of his efficiency.
5. Cooperating with other departments of the school in administering health tests and in interpreting results.

*D. Investigation and Experimentation.—*

1. Using tests for evaluating method of teaching.
2. Using test results to check on value of activities and materials that have been accepted because of empirical claims and common practices.
3. Constructing reliable and valid tests in the absence of appropriate tests available for felt needs.

### IX. General Factors

1. Learning to overcome disciplinary problems of whispering, interruptions, cheating, indifference, waste of time, etc., by: (*a*) socializing the work of the class; (*b*) developing higher moral standards in pupils through participation in cooperative activities; (*c*) motivating work of class; (*d*) penalizing promptly when situation demands it; (*e*) understanding the use of leadership in varied situations; (*f*) having space and equipment ready before class period.
2. Knowing how to adapt space and equipment to group and activity.
3. Knowing how to secure effective use of time.
4. Having for herself high standards of attainment.
5. Providing extra-class activities to meet varied interests of pupils.
6. Obtaining sufficient equipment for use in a varied program of activities.
7. Conducting a physical education program as an expression of the best principles and practices related to the whole school program.
8. Preparing department reports.

## USES OF THE DATA RELATING TO TEACHING DIFFICULTIES IN PHYSICAL EDUCATION

This check list is designed for use in helping to locate teaching difficulties in classes of normal children and makes no pretense of being applicable to orthopedic or special remedial classes. It is not a form for rating teachers and therefore does not approach the teaching problem from the standpoint of the intelligence, personality, or health of the teacher herself.

It is suggested that the list might well be used in the planning and revising of courses in physical education since it is largely derived from observed difficulties in actual practice. The data on difficulties should be of value in teacher-training courses. The teacher should find it of use in self-analysis and as an aid in the preparation and conduct of her class and extra-class activities.

The check list should be useful to supervisors in analyzing the strengths and weaknesses of teachers in practice. It may be broken up into parts and used more effectively in observations. Special items throughout the list may be found to be applicable in helping to overcome the more outstanding difficulties. Finally, it should help the supervisor to make teachers' meetings more vital and of genuine help to her teachers.

# The Factor of Age in Teaching Physical Education

By L. Joseph Cahn
*Health Education Department*
*Townsend Harris Preparatory School*
***The College of the City of New York***

AGE has become a matter of grave concern in industry. Men in their fifties have found themselves refused employment again and again because of the policy, "We need younger men." This policy has even been extended to those in their forties.

The same problem has been raised by administrators in education regarding the teachers of physical education activities. Owing to the rapid expansion of physical education, the veterans have been absorbed into administrative positions. The point will be reached, however, and in some communities has been attained, where there are few openings for executive positions. The mass of teachers will have to instruct in all phases of physical education as there are not enough places for all in lecture courses and administration. The question is: can the older teachers, forty to sixty years of age, render efficient service? One prominent college president stated the problem to a group of younger teachers as follows: "If we adopted the Board of Education system with a large group of you, and you all stayed in the service and went to the maximum, we would have an organization consisting of a large number of highly intelligent human beings wholly incapable of doing the type of floor work essential for the students."

The purposes of this article are: (1) to set forth certain facts and arguments in the effort to disprove the statement referred to above; (2) to encourage investigation into this problem.

Dr. Walter R. Miles, of Yale University, in a Presidential Address delivered before the American Psychological Association at Ithaca, September 9, 1932, said, in part, concerning age and human ability, "The smallness of decline in reaction speed in middle maturity and the persistence in later maturity and in old age of skill in rotary motility and in reach and grasps, is very striking. . . . Guessed on the basis of what industry has popularly said of the old, and also in terms of the derogatory reports made by old people about themselves, the situation has appeared far harsher than the objective data warrant. . . . *Maturity, later maturity, and senescence are still the realm for folklore, anecdote, and personal impression.*"[1] (The italics are mine.)

[1] *Psychological Review*, 401: 2 (March 1933) 114, 101.

The assumption that old age would so impair the efficiency of physical educators that they would be unfit for teaching before the time of their retirement has not been made for those teaching physical education under the Board of Education in New York City. This is apparent from the fact that there are no policies or laws under this Board of Education restricting the salaries and promotions of those persons teaching physical education under its jurisdiction. A survey, made in June, 1937, of the ages and years of service of those teaching in the Health Education Departments in the high schools under the supervision of the Board of Education of New York City shows:[2]

AGE GROUPINGS OF THE SPECIAL TEACHERS OF HEALTH EDUCATION AND THE TEACHERS OF HEALTH EDUCATION IN THE HIGH SCHOOLS, IN SERVICE AS OF JUNE 10, 1937

| Age Group | Number | | Per Cent | |
|---|---|---|---|---|
| | Men | Women | Men | Women |
| Under 20 | 0 | 0 | .. | .. |
| 20–24 | 2 | 1 | .7 | .3 |
| 25–29 | 44 | 22 | 13.6 | 6.1 |
| 30–34 | 84 | 61 | 25.9 | 16.8 |
| 35–39 | 52 | 77 | 16.1 | 21.3 |
| 40–44 | 53 | 84 | 16.4 | 23.2 |
| 45–49 | 40 | 61 | 12.3 | 16.8 |
| 50–54 | 27 | 29 | 8.3 | 8.0 |
| 55–59 | 12 | 18 | 3.7 | 5.0 |
| Over 60 | 10 | 9 | 3.0 | 2.5 |

NUMBER OF YEARS OF SERVICE OF THE SPECIAL TEACHERS OF HEALTH EDUCATION AND THE TEACHERS OF HEALTH EDUCATION IN THE HIGH SCHOOLS AS OF JUNE 10, 1937

| Years Served | Number | | Per Cent | |
|---|---|---|---|---|
| | Men | Women | Men | Women |
| Less than 5 | 62 | 56 | 19.7 | 15.5 |
| 5– 9 | 105 | 66 | 32.4 | 18.2 |
| 10–14 | 65 | 111 | 20.1 | 30.7 |
| 15–19 | 38 | 64 | 11.7 | 17.7 |
| 20–24 | 32 | 34 | 9.9 | 9.4 |
| 25–29 | 10 | 18 | 3.1 | 4.9 |
| 30–34 | 7 | 10 | 2.2 | 2.8 |
| 35–39 | 3 | 3 | .9 | .8 |
| Over 40 | 0 | 0 | .. | .. |

Thus, 49 men, or 15 per cent, and 56 women, or 15.5 per cent, are over fifty years of age; 89 men, or 27.3 per cent, and 117 women, or 32.3 per cent, are over forty-five; 142 men, or 43.7 per cent, and 201 women, or 60 per cent, are over forty. The expansion of physical education, and the need for instructors in the new buildings in New York City, should be considered in a study of the above chart.

The following age and tenure analysis of physical educators of the

[2] Board of Education, New York City, Bureau of Records.

Young Men's Christian Association of the United States, as of April 9, 1937, shows conclusively that men are able to, and do, teach physical education after they have reached the age of fifty-five.

AGE AND TENURE ANALYSES OF PHYSICAL DIRECTORS IN THE Y.M.C.A.'s OF THE UNITED STATES, AS OF APRIL, 1937[3]

| Age Group | Number | Per Cent |
|---|---|---|
| Under 20 | .. | .. |
| 20–24 | 17 | 2.89 |
| 25–29 | 117 | 19.89 |
| 30–34 | 139 | 23.63 |
| 35–39 | 105 | 17.85 |
| 40–44 | 84 | 14.28 |
| 45–49 | 54 | 9.18 |
| 50–54 | 43 | 7.31 |
| 55–59 | 22 | 3.74 |
| 60 and over | 5 | .85 |
| | Total 586 | |
| Range 22–60 years | Median | 35.8 years (Mean 36.8) |
| Q1 30.4 years | Q3 | 43.6 years |

| Years Served | Number | Per Cent |
|---|---|---|
| Less than 5 | 113 | 19.21 |
| 5– 9 | 124 | 21.08 |
| 10–14 | 133 | 22.61 |
| 15–19 | 83 | 14.11 |
| 20–24 | 71 | 12.07 |
| 25–29 | 42 | 7.14 |
| 30–34 | 17 | 2.89 |
| 35–39 | 1 | .17 |
| 40 or more | 1 | .17 |
| | Total 585 | |
| Range 0–42 years | Median | 12.0 years (Mean 12.7) |
| Q1 6.9 years | Q3 | 19.0 years |

"The decrease in physical efficiency of any type is a relative factor dependent upon heredity and the total environmental conditions. The fact must be recognized that, in reference to organic strength, physical educators are a superior group, otherwise they would have never passed the rigid physical examination at college for admission at the beginning of their professional careers. This superiority of organic strength should continue for hygiene teachers because of the daily activity involved in the performance of their duties. The decline in physical efficiency of these teachers would not be as great as that of other persons. The shortness of wind, the increased weight, the decline in skills because of a lack of practice is not the plight of persons teaching physical edu-

[3] From Bureau of Records, Studies and Trends, National Council of Young Men's Christian Association; Owen D. Pence, Director.

cation activities. The very nature of their work, it must be recognized, helps to maintain their strength beyond that of other persons.

"Further, the idea that these activities are of such a vigorous nature that they may be successfully taught only by younger men recently graduated from college, is not consistent with the facts in this article that prove men and women in middle life teach physical education activities. Moreover, the argument would imply that the teaching of physical education activities requires the exertion needed by highly competitive athletics. The fact must be recognized that hygiene teachers are not "physical trainers," but are physical educators. Their athletic skill, therefore, is but a tool needed for the teaching of physical education; the physical exertion in the teaching of their subject comes in the form of practical demonstration. A visit to Turnvereins or Y.M.C.A.'s would show men, who are not professional athletes, engaging in far more sustained vigorous activity than that required of the physical education teachers in their teaching of physical education activities.

" 'The ability of the teacher to perform at the time of his appointment is far superior to that required of the students. Although this exceptional ability may decrease with advancing age, the possession of it at one time is sufficient guarantee that the elementary skills taught to the student body will always be a part of the teacher's equipment.'[4] The fact is universally recognized that with age, under proper conditions, comes a maturity of understanding of one's profession, a recognition of responsibilities. Such qualities, when born of practice and study of a profession, definitely increase a person's value to this profession."[5]

The writer knows personally of many physical educators in their fifties and sixties successfully teaching an activity program, and undoubtedly the readers know many such persons. Throughout the world there are many astounding cases of men in their seventies and eighties engaging in athletic activities, such as King Gustave, who, at eighty, plays five sets of tennis in a day; the tri-weekly runs of the eighty-year-old Dr. Graeme G. Hammond, a practicing physician of New York City, who, at sixty-nine, had his gall bladder removed; and the late Jim Ten Eyck, who was the rowing coach at Syracuse University at eighty. The late Justice Oliver Wendell Holmes wrote, at the age of eighty-two, "You make me chuckle when you say you are no longer young, that you have turned twenty-four. A man is, or may be, young to after sixty, and not old before eighty . . . two years ago, except when I remembered that on general principles I ought not

[4] From an address by Professor Joseph Bressler, Chairman of Hygiene Department of Brooklyn College, N.Y., before the Physical Education and Health Society of the College of the City of New York, Nov. 7, 1936.

[5] From brief prepared by Grievance Committee (of which the writer was chairman) of Physical Education and Health Society of the College of the City of New York. Submitted to Board of Higher Education, May 19, 1937.

to, I went upstairs two steps at a time and at a run."[6] Page after page could be filled with such testimony. The writer is unable, at this time, to use such material except to refer to it as a possible field of research.

The arguments premised on the theory that age decreases physical ability so greatly that physical educators in middle age would be unable to teach are usually based on: (1) one person's evaluation of another's physical condition in the light of his own physical condition; (2) ". . folklore, anecdote, and personal impression." The evidence presented in this article tends to show physical educators are able to efficiently continue physical activities after twenty-five or more years of service. The writer appreciates that this conclusion cannot be an accepted scientific fact because of the limited number of cases presented. However, the writer hopes others will more fully investigate this problem.

[6] "How Old is Ninety-one," extracts from letters of Holmes to Dr. John C. H. Wu, *Saturday Evening Post* (March 20, 1937) 27.

# The Civilian Conservation Corps as a Builder of Physical Fitness in Youth

By G. A. WALKER

*Educational Adviser, Company 1756, C.C.C., Fairfield, Iowa*

MUCH has been said and written about the Civilian Conservation Corps as an agency for the rehabilitation of youth in regard to his physical, mental and moral status. However, little or nothing has been proved by research. Proponents and the few opponents are in agreement for the most part that the fundamental principles surrounding the establishment and maintenance of the corps are sound. The universal reception and the attitude of the people toward this movement has been, for the most part, favorable; but it seems wise to this writer that much publicity concerning experimental evidence and other factual information should be furnished the public in every form possible. Therefore, this study on the physical fitness of the C.C.C. enrollee was undertaken.

The only study regarding health that has come to my attention has been evidence showing the high average gain in weight per individual over a six-month or longer enrollment period. That fact alone is merely indicative of good health and is a controversial subject in the medical profession. Acknowledging the dangers of promiscuous statements, as are sometimes made, that for one to be healthy he must be strong and of average weight, I present some results of physical fitness index tests on some forty-four "rookies." It must be kept in mind that I am making no claims regarding improvement of health, but merely an improved physical fitness of the individual, although other evidence points to a high correlation between the physical fitness index and general health.

The subjects were taken from the October, 1936, enrollment, and the entire January, 1937, new enrollment, consisting of seventy-one members. These groups were again carefully tested six months later and at that time strength indices and physical fitness indices were carefully computed. Only forty-four of the original group were in camp at the end of the nine months which was needed for this study.

The Rogers tests (McCloy modifications) were given this group, which means the lung capacity section was omitted and the McCloy arm-scoring system was substituted. The hand-grip dynamometer and a leg-and-back-lift dynamometer were used and a simple apparatus

was built to determine the push-up and pull-up ability. The actual strength was computed and the norm of each individual as to his age and weight was determined from standard charts. The Physical Fitness Index (P.F.I.) was then computed for each individual and the same procedure was followed six months later in each case.

## RESULTS

1. Three cases only, or 6.8 per cent, were found to be normal or above at entrance in the camp.

2. Eighteen cases, or 40.9 per cent, were discovered to be normal or above at the end of a six-month enrollment, showing a net gain toward normalcy of 34.1 per cent.

3. The average P.F.I. at the beginning of these tests was found to be 89.2 (normal is 100). At the end of six months, the average P.F.I. was raised to 97.8, showing an average P.F.I. gain of 8.6 for each individual.

4. The average Strength Index at entrance was 1447.8. At the end of six months, the average S.I. was 1576, showing an average S.I. net gain of 128. per individual.

5. The average age of the cases at the beginning was 20.3+ years.

6. The average weight of a case at entrance was 142.5 pounds and the average weight at the end of a six months period was 144.8, showing an average net gain in weight per individual of 2.32 pounds.

## COMPARISON WITH OTHERS

A number of reports on similar investigations were read, and due to the fact that a C.C.C. camp is a cross-section of American underprivileged youth from all walks of life, and unclassified as to mental age, and grade placement, it was impossible to make a true comparison. However, one was chosen which most nearly met our setup. This study was made by Don H. MacKenzie, on "Effects of Various Activities on the Physical Fitness of University Men," reported in the RESEARCH QUARTERLY, March, 1935. He reported the results of objective investigations on the physical fitness of various physical activities of freshmen at Northwestern University during the fall and winter of 1935. He used the Rogers tests after a medical examination on all freshmen students (282 cases). The tests were repeated three times during the period of four and one-half months from September through January. He found the beginning average P.F.I. to be 106.2. This is unusually high, though the tests were undoubtedly effectively administered. The average P.F.I. elsewhere ranges from 90 to 98. In November the tests were again given, and the P.F.I. average was 111.6 (remarkable, as there is a tendency to drop in grades nine to sixteen during the fall and winter months). The low P.F.I. group showed the greatest gain. In January, the final tests were again repeated and the average was

117.1. The program consisted of intramural sports and field work such as hockey, football, wrestling, swimming, track and basketball. A comparison of the data from Northwestern University and the C.C.C. study appears in Tables I and II. It must be kept in mind that the lung

TABLE I

STUDY MADE AT NORTHWESTERN UNIVERSITY ON PHYSICAL FITNESS*

| All groups 282 cases | Age | Wt. | Ht. | S.I. | N.S.I. | P.F.I. |
|---|---|---|---|---|---|---|
| Sept. Av. | 18–7½ | 142.9 | 68.3 | 1986. | 1924. | 106.2 |
| Jan. Av. | 18–11 | 145.8 | 68.7 | 2249.1 | 1965.4 | 117.1 |
| Change | 3½ | 2.9 | .4 | 263.1 | 41.4 | 10.9 |

* From RESEARCH QUARTERLY, March, 1935.

TABLE II

RESULTS OF PHYSICAL FITNESS TESTS, C.C.C., FAIRFIELD, IOWA

| All groups 44 cases | Age | Wt. | Ht.* | S.I. | N.S.I. | P.F.I. |
|---|---|---|---|---|---|---|
| Initial test av. | 20 yrs. 3 mos. | 142.5 | | 1447.8 | 1608.2+ | 89.2— |
| Final test av. | 20 yrs. 9 mos. | 144.8 | | 1576 | 1624.+ | 97.8— |
| Change | 6 mos. | 2.34 | | 128.2 | 15.8 | 8.6— |

* Height of enrollee not deemed imperative.

capacity and the Rogers method of scoring pull-up and push-up were used in the Northwestern study but not in the C.C.C. study, which to some extent accounts for the higher actual and normal indices of the average Northwestern freshman.

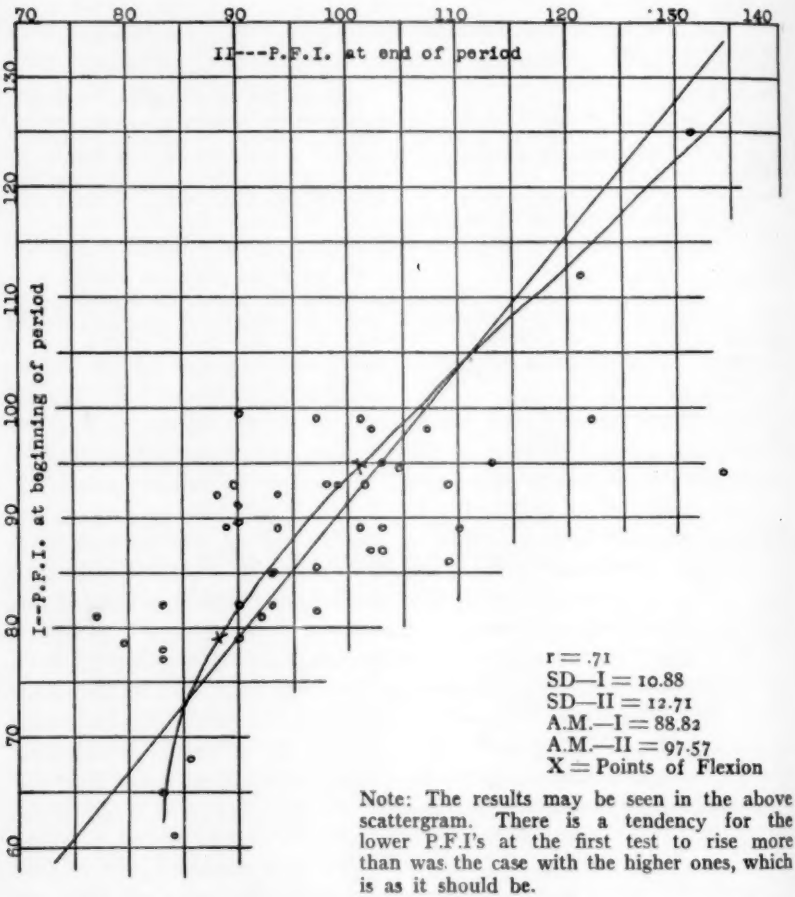
In Figure I, a correlation between the P.F.I. at the beginning of the period and the P.F.I. six months later was made of the forty-four cases. According to McCloy, the results as shown are highly indicative of the accuracy of the study. In addition, the arithmetical mean of group entrance was found to be 89.2. The arithmetical mean of group six months later was found to be 97.8.

## DISCUSSION

1. I feel that I am justified in attributing this increased P.F.I. to the rigorous work and disciplinary routine found in the Civilian Conservation Corps. Regular hours of work, play, and sleep are stringently maintained. The diet is closely checked by a qualified army mess officer, and the menus are supervised by medical officers attached to the army.

2. The work of this camp, a soil conservation service camp project, is done on the farms in this county in tree planting, building of permanent and temporary structures for soil control, terracing, quarrying, limestone crushing, etc.—all of which is done in a healthful, outdoor

environment. In addition to the field projects, their daily routine of camp and barracks maintenance is closely followed. Their recreational activity is quite varied, consisting of reading, movies, hobbies and crafts, music, touch football, basketball, baseball, kittenball, track and




Note: The results may be seen in the above scattergram. There is a tendency for the lower P.F.I's at the first test to rise more than was the case with the higher ones, which is as it should be.

field, swimming, badminton, ping-pong, horseshoes, and agricultural pursuits.

3. It is our belief that such a wholesome, well rounded physical and mental program is most conducive to good health.

4. A large percentage of the subjects in this study, upon taking these initial tests and when they were weighed and interviewed, were found to be malnourished and to have had little or no experience in any trades or occupations. The outlook and attitude was many times dis-

tressing and even an untrained eye could see a marvelous favorable change take place during this six-month training period.

5. Although the average gain in weight per individual was but 2.23 pounds, the flabby, flaccid musculature and pallid skin were replaced by a firm and strong musculature accompanied by a healthy looking complexion during this six-month interval.

6. The depressed, defeatist attitude of many of the boys as manifested in my counseling at the beginning was largely lost, and replaced by a marked appearance of a positive personality growth.

7. In view of the above objective facts and subjective observations and conclusions, I feel that the money and time expended on these boys, if only for an increased physical fitness and improved mental outlook, is justifiable.

# Vitality Indexes for Summer Camps

By C. S. Alexander
*Professor of Sociology*
*Westminster College, Fulton, Missouri*

ANOTHER summer camping season is now at hand. Children are making the most of the warm, happy days of their long summer vacation. Parents are either eagerly planning their vacations or have departed on their journeys. Camp directors and health officers are anxiously considering plans for the best season they have ever had at camp. This means work. It also means a consistent and extended study of methods which may be used to assure their campers the maximum of pleasure, of health, and of constructive social experiences.

Camp officials and parents are constantly on the alert to find indexes which will measure what effect camping experiences have on their children. Since no compound and wholly efficient index is at hand one must be satisfied with the progress that is being made in building up measures for the benefits that campers should receive. One of the first and best known is the simple weight index. Many parents and camps consider that if a child gains weight in camp, or at least does not lose weight, he must be enriched in several ways. A few go a little beyond this and look for measures of successful social adjustments. Beyond these, more elaborate or more scientific measures are hard to find, and still more difficult to induce some camps to accept as part of their summer programs.

The data on which this study is based were gathered during seven years at a boys' camp. The season was eight weeks long. Careful, consistent records were kept of a number of recurring factors, so that at the end of seven summers the following information is available—the names and ages of the campers, the dates and length of their stay in the camp, the volume of program and the kinds of activities for the camp for each day, as well as the number of participants, the thermometer readings taken several times a day, the barometric pressure, the kinds of foods and volumes used each day in camp, and other similar facts. These provide such a mass of material that only sections of it may be presented at any single time. Another aspect of the study concerned the number and kinds of visitations made to the camp health officer every day.

Some of the campers came for two weeks, many of them stayed eight weeks. The average length of stay was five and one-half weeks.

Table I illustrates the number of campers who gained weight each

week during seven summers. The figures are given as percentages of the number who were in camp each week. The mean gain was 55.7 per cent. The highest gain during any week was 81.7 per cent, and the lowest was 26.7 per cent. The problem was to find the reasons for the variation in these percentages. The next step was to try to regulate these changes. The third was to discover what a normal situation would be like. It seemed quite possible that the change from city life to the fresh air, exercise, and freedom of camp life would produce changes in weight. These boys had nearly all of the advantages of normal homes, and it is assumed that want should not have been the cause of malnutrition, if it were present.

TABLE I

THE PERCENTAGE OF CAMPERS WHO GAINED WEIGHT

| End of Week | Summers Covered by the Study | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | Average |
| 1 | 34.3 | 81.7 | 68. | 75.8 | 59.4 | 71. | 75. | 66.4 |
| 2 | 64. | 50. | 64. | 42. | 50. | 64. | 68.2 | 57.4 |
| 3 | 26.7 | 45.6 | 49.2 | 61. | 49.5 | 69.3 | 65.5 | 52.4 |
| 4 | 58.4 | 40.8 | 68. | 43.5 | 57. | 68. | 64.5 | 57.2 |
| 5 | 44.6 | 54.5 | 35.3 | 53. | 38.5 | 65.1 | 63.5 | 50.9 |
| 6 | 43. | 54.7 | 59. | 55. | 46. | 68. | 67. | 56.1 |
| 7 | 50. | 47. | 55.7 | 49. | 76. | 65.7 | 64.2 | 58.1 |
| 8 | 44. | 42. | 53.2 | 48.6 | 35. | 65. | 68.1 | 49.4 |
| Average | 45.6 | 50.2 | 56.5 | 52.2 | 51.5 | 67.1 | 67. | 55.7 |

The question arises now about the 44.3 per cent of the campers who had not gained weight. Additional study from the available figures shows that 12.6 per cent did not change weight. This leaves a total of 31.7 per cent who lost weight. It must be kept in mind that campers might lose weight one week and gain it back the following week. Overnight trips or canoe trips usually reduced weight more than the other camp activities. One must also remember that the figures given above do not mean that 31.7 per cent of the campers weighed less when they returned home than when they went to camp. The lowest percentages of gains occurred on the second week in camp on two years, once on the third week, once on the fourth week, twice on the fifth week, and once on the eighth week. It would not be correct to say, from reading these figures, that the lowest percentages of gains occur on any particular week. It is observed, however, that the first and the seventh weeks do not appear in the above figures. In the average for the seven summers the fifth week was the one which shows the lowest percentage of gains. In this camp there were not enough boys who remained only the first four weeks to account for this low score alone.

We have just observed that the mean of the losses in weight is 31.7

per cent. This looks large, but is not so significant as it seems since many of the losses were less than one pound per person. While these figures concerning changes of weight are being studied, it is well to keep in mind the central problem. What effect does loss of weight have on a child in camp? The answer may well be left to the medical authorities, and it will be a complicated reply. The present study was made to discover some indexes that may be of considerable value. In this observation so far we noticed that the mean gain in weight was distributed over only 55.7 per cent of the campers in this camp.

The actual weight losses as gleaned from a composite curve show that, as a sample, in three summers, two boys, eight years old, lost only .25 lb. each; 8 nine-year-old boys lost only .62 lb.; 14 ten-year-old boys lost .61 lb. each; 36 eleven-year-old boys lost .2 lb. each; 29 twelve-year-old boys lost .21 lb. each; and 1 nineteen-year-old boy lost 2.25 lbs. This older boy was overweight, and planned to reduce some at camp. We note immediately that the average loss for these 90 boys is only .35 lb. each, or 5.6 ounces for each boy.

The weighing was done on the same day each week, and always during rest hour, that is right after dinner. The boys were taken to the camp health officer's building in cabin groups, by their counselor, and adults did the weighing. Weights were taken without clothing. Every reasonable precaution was taken to be sure that the process was uniformly done. The same scales were used each summer, and frequently retested with another pair of scales. A single weight chart was kept for each camper.

Referring to the table given previously, one observes that the average week end weights, as expressed in percentages, tend to increase. This is particularly seen as one examines the years numbered VI and VII. The figures showing the increases in weights were compiled at the end of each summer in order to prepare plans for the following year. The camp staff, guided by these figures, made plans to reduce the decline in weight and still to have a wholesome, interesting camp program. Some of the plans were as follows:

1. The rising hour during the first summer had been at 7:00 A.M. The "dip" was compulsory, and after the "dip" the campers were urged to hurry for breakfast. During the following summers the rising hour was set later until it was finally fixed at 8:00 A.M. The "dip" was no longer compulsory, but all were urged to arise for the morning exercises. The lengthening of the hours for sleep meant that the campers had more rest, and the later hour in the morning meant that the air was not so chilly.

2. Several thermometers were set up around camp. When the weather was quite warm, the strenuous camp programs were replaced by lighter activities, which might be conducted in cool places.

3. The rest period after the mid-day meal varied in length according to the temperature, and according to the difficulty of the afternoon program.

4. The evening hours closed with singing and stories, with the result that the campers went to their cabins more quietly and fell asleep more easily.

5. A light lunch was prepared at 8:00 P.M. each day for those boys who were falling off in weight.

6. Heavy games and long swimming periods were reduced or removed from the schedule when the weather was very hot. Several short swimming periods were allowed in place of the 45-minute periods.

7. The retiring hour was advanced from 9:00 P.M. to 8:30 P.M., and the "all-quiet" bell was sounded a half hour later.

The net result of these changes was that the whole camping experience seemed to be more interesting, the nervous tension of campers and staff was reduced, and we had more time to enjoy the thrills of leisurely meetings and ceremonial affairs. On the records of the last summer, the column numbered VII, we find that only one boy came home from camp weighing less than when he went to camp, but only by one pound.

Weight is a valuable index in studying camp health problems. It can be scientifically studied and scientifically managed. It may not be possible to regulate weight for each camper, but careful planning can exercise great control over the weight gains and losses for the vast majority of the boys or girls who attend.

## THE RELATION OF AIR TEMPERATURE TO LOSSES IN WEIGHT

The temperature of the air is not the only cause for loss in weight but it may be one of the significant ones. In order to observe this relationship records were kept for five years of the highest and lowest temperatures for each day during the whole camping season, and the barometric readings.

From a temperature-weight curve several things were observed. The first is that the weight curve falls as the temperature curve rises. We also note that the peak of the temperature curve is slightly in advance of the peak of the weight curve. That is caused by the fact that sudden changes in temperature do not immediately produce changes in weight. If the cooler or warmer weather continues for a day or two the change may appear again in the weight-change percentages at the next weighing period. After the fourth week the temperature changes are not so great and the weight percentages do not vary so much, nevertheless we observe that a smooth curve would show the divergent tendencies quite nicely. This curve is not greatly different from other weight and temperature curves for other summers.

LENGTH OF PERIOD IN CAMP COMPARED WITH WEIGHT CHANGES

It has been stated that a boy may well be expected to gain weight if he remains in camp a short time, but after a certain period he will cease to gain. This is apparently an attempt to generalize with insufficient evidence. The present section of this study may not constitute adequate evidence, but it should add considerably to it.

The losses and gains in weight of all campers were tabulated according to the length of time that each boy remained in camp. When the total gains in weight were distributed over the total number of boys we found the average increase in weight to be .94 lb. That is nearly one pound for each boy. The gains in weight according to the length of stay, for the seven summers, is as follows:

| | | |
|---|---|---|
| Those who remained only one week | lost | .34 lb. on an average |
| Those who remained two | weeks gained | .57 lb. on an average |
| Those who remained three | weeks gained | 1.47 lbs. on an average |
| Those who remained four | weeks gained | 1.34 lbs. on an average |
| Those who remained five | weeks gained | .73 lb. on an average |
| Those who remained six | weeks gained | .39 lb. on an average |
| Those who remained seven | weeks gained | 1.88 lbs. on an average |
| Those who remained eight | weeks gained | 2.15 lbs. on an average |

When we examine these figures, we note that the gains tended to increase up to the end of the first half of the summer period, then the figures fall, and again start to climb toward the end of the summer. It was noted each summer that the boys in the upper ages remained longer periods than the younger boys. This was not generally true, as many of the smaller boys stayed eight weeks at camp. However, it is true that the majority of those who spent eight weeks there were older than the average age of all of the campers, which was twelve and one-half years.

Some of those who remained only one week came to camp to find out whether they would like the experience. Some found that they did not like living in a cabin with seven or eight boys, and eating at tables with so many. They returned home at the end of the first week. In some cases it was arranged with the parents that they drive to camp at the end of the first week in order to talk over the progress of their son. When a boy is homesick and unhappy in camp he will take the first chance his parents give him to go home. In 3 of the 7 years being studied, 24 boys went home at the end of the first week in camp. That does not mean, of course, at the end of the first week of the camp season, as they may have arrived at a later date than the opening of camp. Of this group of 24 boys, 13 lost an average of .84 lb. each. Of 103 boys who remained 2 weeks, 53 lost .10 lb. each, while 11 of these boys gained .25 lb. each, and 39 gained 1.5 lbs. each.

At the end of the five-week stay, 12 boys lost .21 lb. each. This, in the final summary, is off-set by 10 boys who gained 2.4 lbs. each.

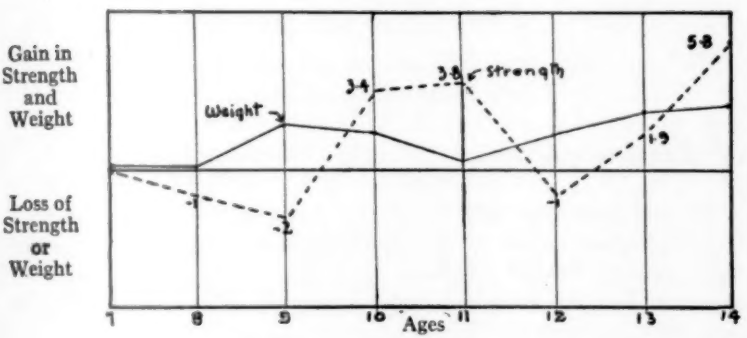
The causes of the decline during the fifth week are not all known.

In a few cases boys came to remain four weeks. During this period the parents decided to leave their sons in camp for one or more weeks. In several instances the boys were much disappointed as they had hoped to accompany their families on automobile tours, or on other vacation experiences. The disappointment caused certain unhappy consequences for the boys. This may not account for the decline in weight of some of the boys who remained five weeks. The weather cannot be called upon to explain the loss of weight in every case since the fifth week in camp on several summers was not the warmest. For those who had been there from the beginning the hot days were not matters of new experience. Boys get browned and accustomed to the sun. Another point of significance that is evident is that the end of the five-week period for some boys did not fall on the fifth camp week as some boys came at the end of the second or third week.

## STRENGTH TESTS

Records were made during summer VII of the strength of grip tests. These tests were given at the end of each week, and were confined to the grip tests for the right and left hand. The Jetter and Scheerer Dynamometer was used. The curves given in Figures I and II

FIG. I. Comparison of Strength and Weight Changes by Ages.



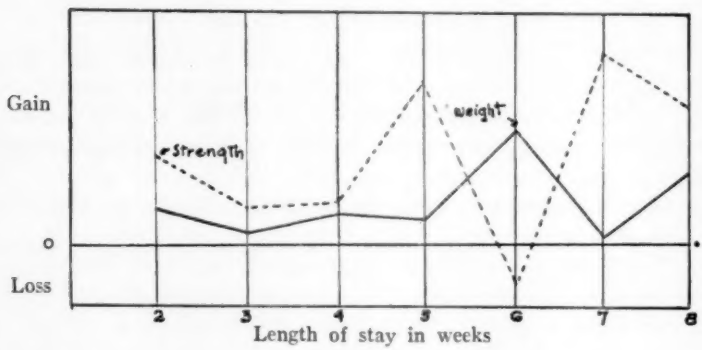

show the trends of the weight changes for the whole camp population and the variation in the strength tests. Close study of the curves show they tend somewhat to move in opposite directions through certain age groups. This is particularly evident for the ages eight to thirteen years. Thirty-seven boys were included in this age range. They were tested each week at the same time that weights were made.

A study of the curves which compare the changes in weight of campers, the length of stay in camp, and the summary of the strength tests shows that they do not follow any consistent pattern. Those who

remained two, three, or four weeks in camp did not gain strength as measured by grip tests. The gains in weight for the boys who remained five weeks are slightly less than those of the fourth, sixth, and eighth weeks. The strength tests for the whole camp showed a large increase on the fifth week, while the average weights fell off slightly. Weight again climbed high on the sixth week, and strength averages fell sharply off. Strength again climbed to an unprecedented record on the seventh week, while weight averages declined. Weights climbed toward the end of the camping period and strengths fell away from their higher score.

It was observed that the strength scores were lower on warm days than in cooler weather. The experience of several summers demon-

FIG. II. Comparison of Strength Changes with Length of Stay.




strated that weights tended to climb as the temperature of the weather fell.

From observation and experience it seems to be a good plan to watch the temperature curve, the average weights, and the results of simple strength tests. Of these three the strength tests seem to be easiest to change. When the camp as a whole is in an excited state, or when the campers enter into a spirit of competition with one another, or attempt to break their old records the average strength tests will increase. In this experiment the attempt was made to urge each camper to do his best but not to pay much attention to competition. This plan seemed to produce the most consistent results.

An effort was made to offset the perspiration on the hands on warm days by supplying powder to be sprinkled on the palms.

The individual records of the campers show that 5 per cent of the boys lost weight and strength at camp. These boys were twelve years of age, and all remained less than eight weeks, and more than three weeks. Thirteen per cent lost weight and gained strength during their

stay at camp, 26 per cent gained weight and lost slightly in strength, 57 per cent gained weight and strength both. Further details are:

37 per cent gained weight and gained strength
26 per cent gained weight and lost strength
13 per cent lost weight and gained strength
5 per cent lost weight and lost strength
1 per cent lost strength while weight remained the same
4 per cent gained strength while weight remained the same
5 per cent lost weight while strength remained the same
6 per cent gained weight while strength remained the same
3 per cent had no change in either strength or weight

The preceding figures show that a variety of changes may take place during a camping experience. It is not known which one of these nine possible situations is the most desirable. In the final analysis it would probably depend on the camper and what his particular needs were. At least these figures show that a boy may either gain or lose strength independently of his weight changes, although 37 per cent gained both in weight and strength. One of these nine possible combinations stands out as apparently undesirable, that is loss of weight and strength. Again, it must be kept in mind that all of the factors are not known. There were only 5 per cent of these cases. The whole process required 1,014 tests, weighings, and measurements during the summer.

## VISITS TO THE CAMP DOCTOR

The camp doctor kept a log or day book each summer. In this book were listed the name of the camper who called, the cause of the visit, what care or treatment was given, and the date. These facts piled up for seven years. Each year they were analyzed in order to make better preparations for the following summers.

The summary of visits proved to be of very great assistance as it gave a time distribution for each day in camp, and certain injuries or ailments were found to appear fairly regularly in each camp season. It also gave specific information concerning the causes of the various calls.

When a camp director and camp doctor have direct information in advance concerning the probable ailments of their campers, and the relative frequency of their appearance, they will both make plans to care for the experiences that seem to be directed toward them, and to ward off as many as possible of the actual ailments. That is, if one might predict that the average number of calls on the camp doctor, each summer, for the treatment of ear troubles would be 35.8, he should first of all make very exacting investigations into the causes of these troubles. These causes can usually be searched for before camp opens, or after it closes. When the causes are found the next logical step is to eliminate them.

The exact method of investigation should be to ask and answer

these questions: What happened? What were the causes? How can they be eliminated? These simple questions require the utmost in patience and scientific research to answer them. One who thinks that he can lift a camp from the ranks of the ordinary to the position of scientifically operated camps by simply stating that ill health and injuries are of necessity a part of every camp experience, is not really touching the problem of health at all. It may not be possible to eliminate ill-health entirely but scientific studies will help to remove a great part of the difficulties which children have at camps.

The following classifications of kinds of ill-health and mishaps at camp were derived from a study of seven summers, during which every call was registered.

| Cause of Visit to the Camp Doctor | Average Number of Calls per Summer | Ranking on This List |
|---|---|---|
| Cuts | 85.5 | 1 |
| Bumps, Bruises, Stubbed Toes | 63.7 | 2 |
| Rash, Skin Infection | 44.1 | 3 |
| Sore Throat | 37.7 | 4 |
| Earache, Infections | 35.8 | 5 |
| Stomach Disorders | 33.2 | 6 |
| Colds | 32.8 | 7 |
| Blisters (from rowing, etc.) | 30.4 | 8 |
| Boils, Pimples Infected | 29.5 | 9 |
| Temperature (tests) | 26.2 | 10 |
| Sunburn | 20.1 | 11 |
| Eye Trouble (various causes) | 19.7 | 12 |
| Sore Muscles | 17.0 | 13 |
| Scratches | 15.1 | 14 |
| Headaches | 14.4 | 15 |
| Splinters under Skin | 12.8 | 16 |
| Nail Punctures | 10.7 | 17 |
| Mosquito Bites | 10.0 | 18 |
| Pimples | 8.7 | 19 |
| Sinus Infection | 6.1 | 20 |
| Teeth, Fillings, or Aching | 5.5 | 21 |
| Constipation | 4.4 | 22 |
| Hay Fever | 1.2 | 23 |
| Nosebleed | .7 | 24 |

Each year a study of such a tabulation was made and steps were taken to find and remove the causes of as many of these as possible. Some were more easily managed than others. During summer VII, blisters from rowing were just about removed from the list. Sunburn was reduced, colds and sore throat were reduced, earaches and ear infections were diminished. Nail punctures were reduced to one or two accidents away from camp.

A group of counselors, a committee of parents, a council of campers or others interested could do a considerable amount of good in considering each of these ailments or accidents, and in proposing ways to reduce them.

The whole classification as here given is not made in the way of, or the terminology of, the medical profession. Nothing is said about the medical care of these twenty-four items. The control and elimination of each of these are problems for the camp staff and campers, under the professional advice of the physician.

One should not anticipate that the fewer the number of calls on the camp doctor the healthier the camp. This may not be true at all. Superior camps seem to urged their campers to take their little troubles to the camp doctor, while the troubles are small. The spirit of bravado has caused a lot of unnecessary pain to many campers. Some conceive it to be a trait of manliness, or strength of character, or bravery, to laugh at small scratches and blisters. They may think it a sign of weakness to submit small abrasions to the camp doctor. This spirit must be changed if the health of the camp is to be made better. The reasons why are very evident.

Campers are usually observed when they are being weighed each week, as they sit at the dining table, and just before they retire at night. Suspicious changes in action are immediately detected, and examinations given as often as necessary. This routine, usually carried out by the camp doctor, the nurse, and with the aid of the counselors, takes little time, and removes the obligations from the campers to report any ill health or accidents.

The number of calls on the camp doctor may increase, but they may be for advice rather than for treatment.

## SUMMARY

Vitality indexes for summer camps can be built up. At first they may appear to be complicated but they will soon reduce to more simple conditions and be less difficult to operate.

1. The first index is in the weight charts. The camp index depends on: (*a*) the percentage who lose weight, (*b*) the percentage who gained weight, (*c*) the percentage of campers who did not change. This index can be controlled. It refers first of all to the whole camp population.

2. Loss of weight depends on temperature of the weather, volume of program, amount of sleep, and other factors. The second index related weight and temperature. Both are variables of program. Both can be regulated to a certain extent. The result refers to index 1.

3. Strength as an index seems to be quite dependent on some other factors such as temperature, incentive, fatigue, and interests. It can be related to the weight chart, to temperature, to program volume, and such measurable factors.

4. Accidents and ill health in camp are not subject to pure chance. They have causes, they are preceded by certain situations, and they can be largely controlled. The first step is to methodically study the facts. Each one is subject to its own type of treatment.

These indexes concern camp physical health. They do not include various measures for camp sanitation. Neither do they touch upon the social interests of campers. If campers are having a fine time, if they enjoy the activities, the counselors, and the spirit of camp they will probably have less occasion to seek the camp doctor in emergencies.

The problems of camps are many. The consistent studies that have been under way for some time are gradually changing camping from a series of uncontrolled adventures to scientifically operated educational experiences with none of the thrills missing.

Camps cannot be operated on uniformly high levels unless there are standards available. These standards should be rather concrete. There are many indexes which will help us to measure what happens in camp life. These vitality indexes are part of the whole plan. Co-operative studies will help to refine the processes of camps, and to exchange worth-while information.

# A Selected Bibliography of the Dance in Health, Hygiene, and Physiology

By Paul David Magriel
*Librarian, Ballet Caravan*
*New York City*

THIS special list of references to the dance in health, hygiene, and physiology indicates the wide scope and interest in the dance in relation to the human body. I have selected only those references which bear directly upon this aspect of dancing, as the dance in physical education and eurhythmics has been well catalogued in various numbers of the Research Quarterly. For the most part, my list has been compiled from the material housed in the library of the United States Surgeon-General, Washington, D. C. I would be very happy to furnish more detailed information concerning any of these titles, and would be grateful for any suggestions regarding its further amplification.

Adice Leopold. Théorie de la gymnastique de la danse théâtrale; avec une monographie des divers malaises qui sont la consequence de l'exercice de la danse théâtrale, la crampe, les courbatures, les points de côte. Paris, Napoleon Chaix, 1859.

Alerme, P. E. De la danse "considerée sous le rapport de l'education physique." Paris, Marchands, 1830.

Bachmann, Magdalene. "Zur psychologie and physiologie des Tanzes," *Neue Metaphysische Rundschau.* Jahrg. 5. Heft 6. Berlin, 1901.

Bazzoni, C. *L'igiene nella danza.* Milano, E. Sonzogo, 1882. 23 p.

Benedict, A. L. "The Social and Physical Hygiene of Dancing." *Medical Times.* (March 1907) 65-67.

Blanchard, Georges. "La danseuse." Considérations sur quelques accidents professionels de ses Tendons et Ligaments du Pied . . . Paris, Henri Jouve, 1898. (These pour le doctorat en medicine.) 132 p.

Brill, A. A. "The Psychopathology of the New Dances," *New York Medical Journal,* 99:17 (April 25, 1914) 834-837.

Brown, Richard. Essay on dancing. In his *Medicina Musica,* or a mechanical essay on the effects of singing, musik, and dancing, on human bodies. 51-69. London, John Cooke, 1729.

Burchenal, Elizabeth. "Does Training in Dancing Contribute to General Grace of Carriage and Posture?" *American Physical Education Review.* 10 (June 1905) 101-106.

Cole, Dr. H. G. "The Marathon Dance," *Journal Indiana Medical Association.* 21:12 (December 1928) 523-524.

Dall'Olio, Vittorio. *Igiene e Danza.* Firenze, Salvadore Landi, 1889. 30 p.

"Do the Modern Dances Tend to Stimulate Sexual Activity?" *Medical Times,* 42:3 (March 4, 1914) 65-68.

Dorer, Josephus Ludovicus. Saltatione conservante, morbos inducente, indicante, curante, quam ex d ecreto et authoritate. Gratiosae facultatis medicae. Ba-

densis-Helvetus, Die XXVI. Novembris A.R.S. MDCCLXII . . . Argentorati, ex officina Universitatis Heitziana. 30 p.

Fazio, Eduardo. "Il Ballo in Rapporto All Ginnastica," *Atti del I Congresso Italiano per l'educazione fisica.* Napoli, Giannini & Figli, 1902. 361-367.

Fitch, Clara. "The Influence of Dancing upon the Physique," *Am. Physical Education Review.* 12:4 (December 1907) 324-332.

Gaultier, Jules de. "Essai d'une Physiologie de la Danse," *Archives Internationales de la Danse,* 2 (Paris, April 1933) 47-51.

Glenn, C. L. "The Dance in Physical Education," *American Dancer,* (June 1927) 18-19, 39.

Great Britain, Board of Education. *Dance in Physical Education.* Recreation and physical training series no. 16. London, 1937, 155-95.

Greene, Earl B., and C. H. McCloy. "Bibliography of Health and Physical Education," RESEARCH QUARTERLY, 7:4 (December 1936) 3-43.

Hospital, Pierre. Histoire médicale de la musique et de la dance. Conférences. Clermont-Ferrand, Mont-Louis, 1897.

"Igiene e Danza," *La Salute,* giornale d'igiene popolare. 6:8 (Genova, February 1871) 113-118.

Laffage, Dr. H. Méthode nouvelle de gymnastique hygiénique et orthopédique a l'aide du baton. Paris, A. Maloine et fils, 1918. 64 p.

Lloyd, Gweneth. "The Remedial Value of the Revived Greek Dance," *Dance Journal.* 3 (London, February 1930) 40-42.

Meige, Henry, and Paul Bellugue. "Physiologie et Radiographie du Grand Écart," *La Presse Medicale.* 42:80 (Paris, October 6, 1934) 1565-1568.

Meredyll, Marguerite. "Eurhythmics and the Welfare of the Blind Child," *The Child,* 8 (London, May 1918) 369-376.

Podolsky, Edward. "Dancing and Sexual Emotions," *Western Medical Review.* 32:7 (July 1927) 247-251.

Remy, P. E. Dissertation medicale sur l'exercice de la danse. Paris, Didot, 1824. (Coll. des Theses soutenues a la faculte de medecin de Paris, 1824, tome, 1, no. 12.)

Scheur, Oskar. "Die Erotik im Tanze," *Sexual-Probleme,* Zeitschrift für sexualwissenschaft und sexualpolitik. 7 (Frankfurt a. M., 1911) 38-45.

Schulz, Dr. B. "Der Tanzkramp der Tänzerinnen," *Wiener Medizinische Wochenschrift,* 25:44 (Vienna, October 30, 1875) 259-262.

Service, Neva. "Corrective Dance Rhythms for College Women," *Journal of Health and Physical Education.* (March 1932) 24-26, 61.

Stepanoff, W. J. "Alphabet des Mouvements des Corps Humain." Essai d'enrigistrement des mouvements du corps humain au moyen des signes musicaux. Paris, Vigot, 1891, 68 p.

Taylor, Henry Ling. "The Dancing Foot," *American Physical Education Review.* 10 (June 1905) 137-145.

Thorek, Dr. Max. "Clinical Manifestations of Endurance (marathon) Dancing," *Illinois Medical Journal,* 54 (August 1928) 114-117.

Webster, Mrs. Alfred. Dancing, as a means of physical education; with remarks of deformities and their prevention and cure . . . London, Bogue, 1851, 56 p.

Worthingham, Catherine A. "The Dance and Corrective Physical Education," *Educational Dance.* 1 (June 1938) 8-9.

# The Status of Physical Education for Boys in the State Accredited Class A High Schools for Negroes in Texas

By JOHN E. CODWELL
*Director of Physical Education*
*Phillis-Wheatley High School*
*Houston, Texas*

THE purpose of this study was: (1) to obtain facts concerning the present practices and policies in the organization and administration of the program of physical education for boys in the twelve accredited Class A high school for negroes in Texas; and (2) to offer upon the basis of these facts certain constructive proposals for changes and improvements in the high school programs should the need for such become evident.*

## PROCEDURE

A letter of instruction and two copies of the questionnaire were sent to the directors of physical education in each of the accredited Class A high schools for negroes in Texas. In the letter of instruction the physical education directors were requested to fill out the questionnaires and retain them until called for.

After the questionnaires had been sent and ample time allowed for their completion, the investigator visited each school included in the study, observed facilities (making certain notations concerning them) and collected the questionnaires. Certain useful documentary data that could be secured from high school bulletins and office records were obtained.

Several definite limitations of this study are recognized. Because of the lack of evaluated standards for secondary programs of physical education, it was necessary in making this study to utilize those standards most universally recommended by leading physical educators.

---

This paper is abstracted from a Master's thesis, University of Michigan, 1938.

* The following schools were included in this investigation:
A Anderson High School, Austin, Texas
B Charlton-Pollard High School, Beaumont, Texas
D Booker T. Washington High, Dallas, Texas
F Terrell High School, Ft. Worth, Texas
G Central High School, Galveston, Texas
$H_1$ Phillis-Wheatley High School, Houston, Texas
$H_2$ Yates High School, Houston, Texas
$H_3$ Booker T. Washington High, Houston, Texas
M Central High School, Marshall, Texas
SA Phillis-Wheatley High School, San Antonio, Texas
T Emmett J. Scott High School, Tyler, Texas
W Moore High School, Waco, Texas

Although all of the schools included in this study offered some type of a physical education program, the limited number of schools studied does not warrant the acceptance of the policies and practices employed in these schools as a completely reliable basis for the development of physical education programs in all negro high schools.

## DISCUSSION OF THE DATA

*Administrative Factors.*—All the schools of this study were organized and administered on a nine-month basis. Eight, or two-thirds, of these accredited schools reported a policy of requiring physical education of all students, while 12, or 100 per cent, indicated that they sponsor programs of intramural activities and interscholastic athletics. The per cent of boys enrolled in instructional periods ranged from 38.7 to 100. The mean per cent was 78.74.

The State Department of Education for Texas designates two types of physical education teachers, "part-time teachers," and "full-time teachers." Part-time teachers of physical education are those combining the teaching of academic subjects with physical education teaching or athletic coaching. Full-time teachers are those teaching only physical education classes. Of the 27 physical education teachers for boys in the schools of this study 10, or a little less than one-third, were full-time, while 17, or 62.97 per cent, were part-time instructors. All of these teachers had college degrees. Three had the master of arts degree and eight had studied towards an advanced degree. Two had special teaching certificates in physical education, both being full-time teachers in the field.

Only 3 had majors (30 hours) in physical education, as compared with 10 with minors (18 hours). Fifteen had neither major nor minor in physical education—two of these being full-time teachers, and thirteen being part-time instructors. Four were members of a national physical education association, and 20 subscribed to physical education periodicals.

The average number of hours taught per week by full-time physical education teachers was 27.6, by part-time teachers 26.22.

The question of salaries was considered important in this study in determining the present status of physical education teachers in the schools studied. The data disclose that the majority of teachers received between $800 and $1600 per year. The yearly salary ranged from $630 to $1900, with a mean of $1082.08. A further analysis of the data on salaries indicates that the highest paid teachers were not necessarily those with superior training or the greatest number of teaching hours per week. It appears, upon noting the relation between years of teaching experience and salaries, that remuneration for the physical education teachers in the schools of this study is determined largely by the number of years of service.

Science, mathematics, and social science were the other subjects taught most frequently by the part-time teachers of physical education.

In order that suggestions might be made for program improvement, should the need for such become evident, it was deemed necessary to secure the opinions of teachers relative to the difficulties associated with the physical education programs in their respective schools. Inadequate facilities (92 per cent) untrained teachers (25 per cent) and giving no credit (25 per cent) were difficulties most frequently mentioned.

*Required Physical Education.*—According to the data presented in this section of the study, seven of the eight schools with required programs of physical education state that their programs are especially designed in support of the two objectives, (a) "to stimulate physical growth and development and improvement of body functions," and (b) "to develop skills and attitudes that will 'carry over' and function during leisure time." Other stated objectives received a rating as follows: "to provide opportunities for controlled participation in physical activities that will result in creative experiences" (62.5 per cent); "to develop the organic systems of the body to the highest possible level" (62.5 per cent); "to foster the development of sound mental and emotional attitudes as a result of stimulating and satisfying activities (12.5 per cent); and, "to develop general and special skills as an aid in protection of self and of others (12.5 per cent).

The policy of "instruction" is one phase of the program wherein all of the institutions have similar practices. This, incidentally, is the only phase which received perfect rating by the entire group. Organization of staff, requirements, and granting credit all rank above 90 per cent in group average, indicating fine policy conformity in these respects to accepted standards.

Four of the schools report classes that average over 60 pupils, three indicate class size averages below this number, while one has no limitation.

Conformity to adequate record keeping seems to be adhered to by all schools, with the exception of records of physical ability tests, and records of improvement shown by skill tests, knowledge tests, etc. The data discloses that only three, or 37.5 per cent, of the schools kept such records.

Three-fourths of the schools require five periods of physical education per week, and five, or 83.3 per cent of this number, require periods of 60 minutes in length. All of the schools grant positive credit in physical education, and seven give credit toward graduation. All the schools use regularity of attendance as the chief basis for determining marks.

The twelve activities that are taught most often in the schools of this study that had required programs are: basketball, track events,

touch football, volleyball, marching, boxing, stunts, tumbling, playground ball, tennis, and soccer. Swimming was not taught in any of the schools. Tennis, which gained the highest rank of the "carry-over" sports, was taught in four schools. Basketball and track were taught in all required programs.

Of the ten sections of required physical education considered, three have a group average of less than 75 per cent. One of these was concerned with policies in "Restrictive and Corrective Physical Education." This practice showed a 42 per cent group average. This poor rating in this essential phase of physical education work received impetus from the writer's personal observance of the poor provisions for opportunities for handicapped children, and the lack of properly trained teachers for the same.

The other two sections with poor group rating dealt directly with facilities—further attesting to the claim of these schools that inadequate facilities was a major difficulty associated with the physical education program. The writer noted, in his visits to the institutions, that two of them had recently added modern gymnasiums. An interpretation of the data in this section of the study affords the information that these two schools rank among the first three in institutional rating, thus implying that, other things being equal, adequate facilities are conducive to effective results.

*Intramural Athletics.*—The time allotment usually prescribed for physical education in the secondary school, together with the large number of students to be taught with limited supplies and facilities, often renders it difficult for pupils to acquire, during the course of these periods of instruction, an adequate amount of efficiency in neuromuscular skills, worth-while habits, and desirable attitudes. It becomes imperative, therefore, that the experiences of these students be sufficiently extensive to provide an intelligent appreciation of the various activities of the high school program in which they are inclined, by ability and desire, to participate. In order that this opportunity may be extended these pupils, and in keeping with one of the paramount objectives of the general school program—the providing of wholesome recreation during leisure time—the department of physical education should foster an extensive intramural activity program.

An analysis of the data collected showed that all twelve of the schools sponsor programs of intramural athletics. It was further observed that 82 per cent of certain essential policies and standards are being practiced in these schools. This indicates that apparently intramural athletics in these institutions are being conducted upon a fairly sound basis. Two schools rate lower than 75 per cent. This is due, in part, to the fact that these two institutions gave negative answers to the question as to whether or not intramural activities were run on a budget with funds appropriated for physical education. Six of the

schools give credit for intramural participation.

Ten activities are sponsored by the intramural departments in the twelve schools of this study, with playground baseball, basketball, track events, and volleyball being most frequently mentioned. Tennis, a valuable "carry-over" sport, was listed by only three of the schools.

The per cent of boys participating in intramurals in these twelve schools ranged from 10 to 75, with a mean per cent of 46.8. In more than one-half of the schools, 50 per cent or more of the boys engage in some type of intramural activity.

*Interscholastic Athletics.*—Interscholastic athletics are now considered a definite part of the physical education program of the secondary school. Whether they are a desirable part is dependent very largely upon the policies and practices of their organization, administration, and coordination with the general school program. That athletics can become an evil is evident by the possibility of there arising in the setup, among other things, such obstacles as poor sportsmanship on the part of players and spectators, improper scheduling of games, and a poor financing of the inter-institutional program. On the other hand, interscholastic athletics, properly managed, may contribute to a wholesome school spirit, provide a source of competition for certain pupils who have attained the higher levels in physical skills, and furnish a stimulus for interesting students in the intramural and instructional period programs.

Since athletics can make such an important contribution to the training of the modern youth, it becomes obvious that the program of athletic activities in the secondary school should be organized so as to conform and adhere to certain definite or primary objectives.

All of the schools include football, basketball, and track and field events in their program of interscholastic sports. Only four of the schools have interscholastic competition in tennis—the only "carry-over" sport included in the interscholastic athletic program. Playground baseball and volleyball are the other activities listed in the inter-institutional athletic programs of the schools of this study.

The per cent of boys participating in interscholastic athletics in the twelve high schools ranged from 5 to 33, with a mean per cent of 18. The institution with the smallest total enrollment of boys had the largest per cent taking part in interscholastic athletics. The phase of the athletic program which generally received a low rating was that of health examinations and care of injuries of the competing athletes.

*General Summary.*—In interpreting the information compiled during this investigation, it should be remembered that this study represents data from only the twelve state accredited Class A high schools for negroes in Texas. However, it seems logical and reasonable to assume that conditions in Class B, C, D, and non-accredited high schools

are no better than those included in this study, and probably in all too many instances are much worse.

From the aggregate evidence submitted by these twelve schools, there was little, if any, correlation between the size of the school and the calibre of the program of physical education. Neither the school with the largest enrollment of boys nor the one with the smallest sponsored required programs of physical education.

## CONCLUSIONS

The data in this study reveal that the programs of physical education in these accredited Class A high schools for negroes in Texas, while deserving of commendation in certain respects, stand in need of improvement.

There were four of the schools with no required programs of physical education. The first apparent need, therefore, in the schools of this study seems to be the unanimous inclusion of required courses of physical education. It appears that accredited Class A schools, at least, should conform to this state requirement.

More than half of the physical education teachers were poorly trained for this work, indicating a decided need for prepared instructors in the field of physical education. Fifty-five per cent of the physical education teachers in the schools studied did not even meet the minor requirement of eighteen semester hours in physical education.

Certain aspects of the required program were rated sufficiently low to justify comment relative to improvement in these phases. A review of the data relating to the classification of pupils for physical education work implies that efforts should be made in the schools of this study to classify pupils by some sort of tests so as to place them in more homogeneous groups in so far as physical ability is concerned.

From an observation of the data, it appears evident that the size of the physical education classes in half of the schools with required programs should be reduced and a definite limitation much less than the present number be established. It seems reasonable to assume that the more the sizes of these physical education classes conform to proposed standards the more efficient teaching should result, other things being equal.

An analysis of the data pertaining to grading reveals that much improvement is needed in these school programs in regard to methods of marking. If one of the primary purposes of the physical education period is learning activity skills, then it seems certain that the degree to which one attains this knowledge should be a major factor in grading pupils. Regularity of attendance, costumes, and other factors have their places in computing grades, but they should not be considered solely or preferably to the exclusion of the factor of achievement in skills and knowledge. There seems therefore to be a definite need in

these schools for more emphasis on acquiring knowledge and efficiency in skills as a method of marking.

An interpretation of the data on physical education opportunities for handicapped children indicates that only three institutions offer provisions for restrictive and corrective physical education. It seems that another urgent need in the schools of this study is improvement in this phase of the physical education program. With practically all of the school systems providing school physicians and nurses, it appears that a part of the problem has been solved. It is now up to the school administrators and physical education directors to provide the additional requisites, such as adequate teachers of orthopedics, special classrooms, and other essential facilities. It bears repeating that if physical education is to render its best service it must provide opportunities for every pupil irrespective of his physical status.

A lack of suitable facilities has hindered greatly the physical education programs in the schools investigated. The listing of inadequate facilities as a major difficulty associated with the physical education program by the respective directors further attests to this program deficiency. Gymnasiums in all the schools would be a great aid. The fact that no instruction has been offered in swimming can be definitely attributed to the lack of swimming pools. It would seem that the provision for these facilities in particular is a primary need in these schools.

The data also indicated that more attention should be given to the inclusion of some "carry-over" activities—such as tennis, golf, etc.—in the required physical education program. It is believed, however, that with the securing of facilities for these activities, their appearance in the required program will be a natural sequence.

Programs of intramural and interscholastic athletics have been developed in all the schools. Such a finding may be attributed to the following reasons: (1) intramural and interscholastic participation, from a natural tendency, have attracted more interest both from the administration and the students than the required program of physical education; (2) the lack of or deficiency in the required physical education program has probably created an added emphasis in intramural and interscholastic athletics; (3) facilities and equipment are more available for both types of athletic work than for the required program.

# University of Minnesota Study of Physical Education Facilities and Equipment of the Accredited Public Secondary Schools of Minnesota

By CARL L. NORDLY, Ph.D.

*Assistant Professor, Department of Physical Education and Athletics, University of Minnesota*

DURING the last few years there has been considerable expansion of physical education and community recreation facilities. This development has paralleled the growth of the conceptions that recreation is a phase of normal living and that education is continuous throughout life. Such conceptions have stimulated school and community planning of physical education and recreation facilities. It is reasonable to anticipate that the schools of the future will be utilized as community cultural and recreation centers which will serve larger proportions of residents than is the case at present.

This study originated after members of the Department of Physical Education and Athletics of the University of Minnesota had received frequent requests for advice (1) relative to the construction or improvement of physical education facilities, and (2) about physical education or recreation programs in different localities. The desire to improve the quality of professional training in physical education in this state was another incentive for making the study. How it may contribute in this direction is implied in the following statements.

## PURPOSES OF THE STUDY

The purposes of the study are as follows:

1. To obtain information about facilities in communities throughout the state so that more helpful suggestions may be given when requests are received by members of the Department of Physical Education and Athletics at the University of Minnesota for advice relative to specific physical education and recreation programs.

2. To acquaint those who train physical education and recreation leaders with the obstacles to be overcome by prospective teachers in this state.

---

A paper presented at the Central District Association Convention, Minneapolis, March 24, 1938. The study was made with the assistance of Mr. Marshall Ryman and was financed by the Department of Physical Education and Athletics at the University of Minnesota.

3. To obtain information useful for advising teachers appointed to new positions.

4. To determine the needs for physical education and recreation facilities.

5. To determine cooperatively with the State Department of Education standards for physical education facilities and equipment.

## METHODS OF PROCEDURE

Following an analysis of the literature, a questionnaire was prepared and mailed to sixteen physical education teachers with the request that they respond to the questions as accurately as possible, indicate the amount of time required for completion, and suggest revisions. Only one teacher failed to respond. The favorable return is explained partially by the fact that the members of the group were selected on the basis of an assumed willingness to cooperate.

The questionnaire was revised slightly in the light of the suggestions from the original group. The following items were sent to the superintendents (or principals in large systems) of 462 schools: (1) three copies of the seven-page questionnaire; (2) a letter to the superintendent (or principal) which explained the nature and purposes of the study, informed him that one of the questionnaires was for his personal files, and requested him to deliver two of the questionnaires and enclosed letter to the physical education directors; (3) the letter to the physical education director which explained the purposes of the study and requested him to return a completed questionnaire to his superintendent (or principal) and keep the other; and (4) a self-addressed envelope for returning the questionnaire.

Prior to a follow-up letter which was sent eighteen days later, 243 questionnaires (53 per cent) had been returned. An additional 131 were returned later to make a total return of 389, including the fifteen from the original group, or approximately 82 per cent of the 477 questionnaires which were sent.

## REPORT OF FINDINGS

Only a cursory report of the findings can be made in the space allotted to this paper.

## OUTDOOR PLAY SPACE

One hundred thirteen (34 per cent)* of the schools have less than two acres of outdoor space *at school* for all physical education activities. Of this group 75 have enrollments of 350 or less. Only 59 (18 per cent) of the schools have in excess of five acres of such space on the school site. Fifty-eight per cent have playgrounds and athletic fields on separate sites.

* Unless otherwise indicated the percentages are based on the total number of responses to questions.

TABLE I

DISTANCE IN MILES FROM SCHOOL BUILDINGS TO NEAREST PLAYGROUND EXCLUSIVE OF ATHLETIC FIELDS

| Distance in Miles | Number of Schools |
|---|---|
| Less than ⅛ | 11* |
| ⅛ to ¼ | 16 |
| More than ¼ and less than ½ | 4 |
| ½ to 1 | 14 |
| More than 1 | 0 |

* The figure includes only those playgrounds which are not located at the school site.

TABLE II

DISTANCE IN MILES FROM SCHOOL BUILDINGS TO ATHLETIC FIELDS

| Distance in Miles | Number of Schools |
|---|---|
| Less than ⅛ | 124 |
| ⅛ to ¼ | 70 |
| More than ¼ and less than ½ | 14 |
| ½ to 1 | 71 |
| More than 1 | 8 |

It is evident that physical education needs were not considered seriously when school properties were acquired. Acreage of playgrounds and athletic fields which are located elsewhere than on the school site is not stated here. Such data together with recommendations for space will be presented in the final report.

For practical purposes, the space reserved for physical education should be adequate to provide for the participation of pupils in physical education classes, intramural athletics, and interscholastic athletics, and should adjoin or be in close proximity to the school building. When the outdoor space is monopolized after school by boys' athletic squads, the program lacks balance; the after-school program fails to provide satisfactorily for mass participation in intramural athletics for girls and boys when the peak load in a functioning program may be expected. Pupils should have the opportunity to use the skills they learn in physical education classes in recreative activities of organized and nonorganized, competitive and noncompetitive types before school, during noon hours, and after school. Provision for adequate play space near the school building is both an educational and fiscal economy since such procedure facilitates a balanced program, provides for saving of time of faculty members and pupils, and eliminates hazards of crossing main thoroughfares and railroad tracks.

## GYMNASIUMS

The number of school gymnasiums was reported as follows: none, 54 (15 per cent); one, 250 (71 per cent); two, 45 (13 per cent); three or more, 2 (1 per cent). Nine per cent of the schools have assigned

separate gymnasiums to girls and boys. Gymnasiums were to be available on September 1, 1937, in fifteen of the schools which reported none in May, 1937. If such plans were completed, 312 or 90 per cent of the 351 schools which gave information have one or more gymnasiums. It is interesting to note at this point, although not for purposes of comparison, that in 1926 Wagenhorst reported 73 per cent of 366 high schools in 28 states had one or more gymnasiums.[1] In 1933 Larson found 201 (84 per cent) of 240 high schools in Minnesota had one or more gymnasiums.[2]

The efforts of communities to provide indoor facilities for more adequate school physical education and adult recreation programs has received impetus from federal appropriations. It is assumed that other factors, such as growing public appreciation of the value of physical education in the school curriculum, adult demands for indoor play space for all age groups, and community pride, also have stimulated building programs.

Every junior and senior high school should have at least one gymnasium. The necessary size and number of gymnasiums depend upon the use made of them. Such factors as school enrollment, pupil periods per week, class periods per week, and size of classes are involved. Recommendations relative to size and number of gymnasiums have been made.[3]

In 181 (54 per cent) of the schools, the shower room, locker room, and gymnasium are on the same floor and adjacent to each other. Such practice facilitates supervision, especially where the physical education offices are placed between the gymnasium and the locker room. Adjacent placement of the units also provides for economy of pupils' time when classes are conducted indoors. Another satisfactory arrangement is one in which the gymnasium is on one floor and the locker and shower rooms on the floor below, with the physical education offices so located as to permit supervision of the three units.

It is recommended that future building plans provide direct accessibility from outdoors to the locker room in view of the increase in adult recreation participation. Many schools in Minnesota are now making school facilities available for adult education as indicated by the following data of this study. Adult groups are using the gymnasium facilities: without charge, 130 (33 per cent); upon payment for

---

[1] L. H. Wagenhorst, *The Administration and Cost of High School Interscholastic Athletics.* (New York: Bureau of Publications, Teachers College, Columbia University, 1926) pp. 70, 74.

[2] L. A. Larson, *A Survey of Physical and Health Education in the Public High Schools of Minnesota.* (Springfield, Massachusetts: International Young Men's Christian Association College, unpublished master's thesis, 1933) p. 170.

[3] (a) G. D. Strayer, and N. L. Engelhardt, *Standards for High School Buildings.* (New York: Bureau of Publications, Teachers College, Columbia University, 1924) p. 70.

(b) *Report of the Committee on Schoolhouse Planning.* (Washington, D. C.: National Education Association, 1925) pp. 146-50.

lights only, 66 (17 per cent); upon payment of a flat rental fee, 94 (24 per cent); other arrangement, 9 (2 per cent). The first plan is recommended.

## LOCKERS, BASKETS, AND LOCKS

Two hundred eleven schools have provided lockers or lockers and baskets. Eighty-nine schools reported the use of baskets; fifty schools have box lockers for physical education. In schools where the basket system is used, the minimum number of lockers should equal the number of individuals who use the facilities at a given time, in addition to the peak load of athletic squads. Thus, to determine the number of lockers needed for a certain period, the following must be known: the number in the largest size physical education class, the largest number of intramural participants at one time, and the largest number of adults participating. The largest of these figures should be added to the peak load of athletic squads during the period. Furthermore, a basket should be provided for each individual who uses the facilities exclusive of athletic squad members. Because of the variable factors, the basket and locker needs will vary somewhat during each season.

The kinds of locks in the boys' locker rooms are: miscellaneous pupils' padlocks, 143; combination school-owned padlocks, 109; permanent door locks, 46; and school-owned key padlocks, 36. Need for padlocks was indicated by 34 per cent of the schools. Permanent key doorlocks and key padlocks are not recommended. In addition to the problem of duplicates, keys are frequently lost, mislaid, or forgotten, which causes much inconvenience to the instructor. The use of a combination school-owned padlock which may be opened with a master key is recommended. Lists of combinations should be filed and locked in the instructor's and principal's offices.

## SHOWER BATHS AND TOWELS

Shower baths for boys are lacking in 6 per cent of the schools and for girls in 14 per cent of the cases reported. Such conditions exist for the most part in schools with enrollments of 350 or less. The shower bath is an educational experience in connection with the physical education period; failure to remove soiled clothes and to bathe after vigorous activity is unhygienic. In accordance with principles of health instruction, pupils should be given the opportunity to develop wholesome rather than unwholesome health habits.

The towel systems employed by 344 schools are as follows: furnished free to each pupil, 6 per cent; towel fee is required, 2 per cent; pupil supplies his own, 92 per cent.

When the responsibility for clean towels is placed on the student, unhygienic practices usually follow which are difficult to eliminate through supervision. When students fail to bring towels, they may share them with someone else, and commonly fail to take them home

for laundering. Furthermore, towel losses are frequent since pupils often fail to return them to their homes. Towels should be furnished by the school on the same basis as test tubes are provided for science classes.

TABLE III

NUMBER AND PER CENT OF SCHOOLS USING CERTAIN PRACTICES RELATED TO LAUNDERING TOWELS AND PHYSICAL EDUCATION UNIFORMS EXCLUSIVE OF INTERSCHOLASTIC ATHLETIC UNIFORMS

| | Towels | | Uniforms | |
|---|---|---|---|---|
| Practices Related to Laundering | Number | Per cent | Number | Per cent |
| Delegate responsibility to student | 194 | 84 | 162 | 73 |
| Commercial laundry, charges paid by student | 12 | 5 | 7 | 3 |
| Commercial laundry, charges paid by school | 14 | 6 | 47 | 21 |
| School laundry | 12 | 5 | 5 | 2 |

The most common practice in regard to uniforms for physical education classes is one in which the student supplies his own. Ideally, they should be owned and furnished by the school as is the case for interscholastic athletics. This practice is recommended to provide for cleanliness of the environment.

## SUMMARY

This is an abbreviated report giving the findings of an extensive study and several recommendations for improvement of the *status quo*. No mention has been made of such items as seating capacity and seating arrangements at athletic fields, types and methods of lighting gymnasiums, gymnasium floor markings, apparatus and equipment available, types of lockers, locker and basket needs, and non-school property used for physical education. These and other items are included in the study.

# A Study of the Comparative Recreational Values of Volleyball with Team Games, Dual, and Individual Activities for College Women

By Hiawatha Crosslin

*Assistant Professor, Southwest Texas State Teachers College, San Marcos*

THE concept of physical education has changed greatly in the past few years. Few persons outside the field have followed the shift from the emphasis upon mastery of subject matter to that of progressive experiences. Few people other than physical educators have noted the importance of ascertaining the needs of the growing personality. Those of us within the field of physical education have realized the valuable outcomes of play because a natural situation is involved, but we also know that play is important, not for education alone, but for recreation. We know that racial desires for activity, development, self-realization, and dramatization are important factors of recreational activities for participants. Nevertheless, there are individuals, school administrators, who have seen their particular school enrollment in the light of changing world conditions, in the light of consequent changing concepts of education in general. There has been quite a turn-over, a turn-about-face, for the individual school systems to overtake the educational theories. Practices of accepted theories lag far behind the theories themselves.

Literally nothing is static, since deterioration or growth takes place. Either of these makes for changes of concepts. If growth or development is achieved, naturally the change in concepts must be for growth, for expansion, for development of the individual as a whole, as a unity. When the shift from the formal or artificial setup to the informal or natural situation occurred, some problems immediately arose. About this time great emphasis upon mental hygiene was noted, with a logical outgrowth of this emphasis in the form of recreation. Hand in hand with this problem came that of an appropriate selection of activities for the college girl by the administrator of the department and by the college girl herself in terms of physical development and recreation.

Thus there developed departmentally provision for dual and indi-

---

This article is submitted by the Women's Rules and Editorial Committee of the National Section on Women's Athletics, A.A.H.P.E.R.

vidual activities in order to provide for a variety of recreational interests for after college days. In other words, highly organized team games can be played but little by the majority of adults. On the other hand, badminton, tennis, table tennis, social dancing, archery, golf, swimming, and others may be used both pleasurably and extensively during and after college if the activities during the college career aroused sufficient interest. To be sufficiently recreational, there should, however, be some natural situation provided for mixed groups, participation together of young men and young women. Psychologically, college years should provide wholesome situations for mixed group participation in order to further prepare the young people for optimum adjustments. Thus coeducational activities have acquired an importance in the eyes of the administrators with the result that physical education programs have been planned to include as much of mixed group participation as is practicable.

As a result of this emphasis upon recreational and coeducational recreational activities, these thoughts arise. What have we achieved? What is the result? How have the team games fared in comparison with individual and dual activities?

On the strength of opinions, the subjective element, one may easily say that the benefits of the recreational emphasis (which involves individual or dual activities) are by far greater than could be attained if the emphasis had remained on the highly competitive activities. There was a time when unless a student entered into field hockey, basketball, baseball, or volleyball, and so forth, all of which were considered highly competitive, she struggled under the cognomen "weakling." In the early nineteen hundreds even the game of volleyball was considered an invalid's game because those too weak to play the others mentioned were allowed to participate in volleyball. That time has passed. No longer does the average college girl select the major (or more strenuous) activities, but *seems* to select the minor (or less strenuous) activities. The word seems is used to indicate the subjective element involved. However, are we justified in accepting as conclusive such opinions as the changes in our modern program? Obviously it is not considered justifiable to depend upon opinions.

The purpose of this paper is to present an actual situation over a period of three years, 1935-1938. The situation pictured is at Southwest Texas State Teachers College, San Marcos, Texas. The policy of the Physical Education Department for Women above the freshmen level is to require attendance twice weekly for instruction. The third attendance is *recreation*. The student may elect to participate in any one of the thirty-seven activities provided for by the department. It is not compulsory that she follow any regularity as to selection of activity. It is necessary that once each week she participate, but her

choice may be as varied as there are numbers of weeks in the semester. Therefore, in the course of a semester, the number of activities for one individual may range from one to eighteen. Let us consider now the following comparative facts in regard to volleyball for college women.

1. Volleyball compared with other activities requiring six or more players:
   *a*) For the years 1935-1938.
   *b*) On a monthly basis.
2. Volleyball compared with dual activities:
   *a*) For the years 1935-1938.
   *b*) On a monthly basis.
3. Volleyball compared with individual activities:
   *a*) For the years 1935-1938.
   *b*) On a monthly basis.

In considering a comparison of volleyball with team games of six or more players, the following selection seemed appropriate because they may be played in all sections of the United States, and because all of these activities are included in the activity program in the majority of the college catalogs.

TABLE I

PERCENTAGE PER ACTIVITY FOR ENTIRE NUMBER OF RECREATIONS (8,278) AND PER YEAR

| | Years | | | | | | |
|---|---|---|---|---|---|---|---|
| Activity | Per cent 1935 | Per cent 1936 | Per cent 1937 | Per cent 1938 | Per cent No date | Entire Period | |
| Baseball | Zero | 3.63 | 14.11 | 7.26 | 75.00 | 2.97 | (2) |
| Basketball | Zero | 1.49 | 2.98 | 31.34 | 64.18 | .81 | (4) |
| Hockey | 2.94 | 2.94 | 23.52 | 35.30 | 35.30 | .49 | (5) |
| Soccer | .43 | 1.29 | 24.47 | 2.57 | 71.24 | 2.79 | (3) |
| Volleyball | .90 | 6.46 | 26.47 | 19.85 | 46.32 | 8.03 | (1) |

Thirty-seven activities were offered to the students above the freshmen level by the Department of Physical Education for Women from which students could choose their recreations each week. Table I indicates the peak for all the sports in the "no date" column. This column is composed of recreation cards which were not properly dated. For the other columns the year 1937 was the most popular for all activities except hockey. More emphasis was given that sport in the credit and activity classes in 1938. Thus a definite carry-over is indicated by an increase to 11.78 per cent in 1938. However, in the column per activity for the entire period, volleyball easily ranks highest of these particular team sports with 8.03 per cent. Baseball, the second highest, is 5.06 per cent lower. This indicates an all-roundness about volleyball which is significant, from a recreational point of view.

To investigate further this comparative study, let us now consider

these same activities on the basis of the percentage per activity per month, as shown in Table II. In order to obtain this information,

TABLE II

PERCENTAGES OF TOTAL NUMBER OF ACTIVITIES PER MONTH

| Activity | Jan. | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|
| Baseball | 10.48 | Zero | 4.44 | 4.03 | 4.83 | 1.21 | .81 |
| Basketball | 58.21 | 1.49 | 17.91 | Zero | 1.49 | 1.49 | Zero |
| Hockey | 29.41 | 14.70 | 5.88 | 5.88 | 8.82 | Zero | Zero |
| Soccer | 4.30 | 1.29 | .43 | Zero | .43 | Zero | 1.29 |
| Volleyball | 18.49 | 3.45 | 3.31 | 2.11 | 1.82 | 10.21 | 12.34 |

| | Aug. | Sept. | Oct. | Nov. | Dec. | No Date | Average |
|---|---|---|---|---|---|---|---|
| Baseball | .81 | Zero | 55.65 | 10.59 | Zero | 6.85 | 7.61 |
| Basketball | 1.49 | Zero | 1.49 | Zero | Zero | 14.92 | 7.57 |
| Hockey | Zero | Zero | Zero | 5.88 | 23.52 | 5.88 | 7.69 |
| Soccer | Zero | Zero | 12.02 | 69.96 | 5.56 | 4.72 | 7.61 |
| Volleyball | 2.11 | .73 | 3.42 | 9.46 | 25.88 | 6.61 | 7.68 |

recreation cards for these activities were handed in by the students who participated. In some instances the cards were incompletely filled out, as the last column "no date" indicates. There was no pressure as to the recreation chosen, but the fact that certain activities lend themselves better to certain seasons is obvious. For instance, in regard to baseball in January (a cold month) 10.49 per cent participated, whereas in October (usually a mild month) 55.65 per cent participated. On the other hand, the basketball percentage ran higher in January than in any other month and was considerably lower in October with a percentage of 1.49. Volleyball, a more consistently participated in activity, had no zero months although its percentage was never very high. The percentage of .73 for September is significant in two ways: students had only one week of school, and second, none of the other activities were chosen. There seems to be justification on the basis of the above figures for the value of volleyball as a "year-round" activity. In consideration of the average percentages for these team sports you will observe that hockey ranked highest with 7.69 per cent, and volleyball second with .01 per cent less. The others were from .08 to .21 less. The conclusion is that volleyball ranks very favorably with highly organized competitive activities of six or more players.

So far we have considered team games in two ways: 1, per activity per year for 1935-1938 and per entire number of recreations; 2, per activity per month with average percentage per month per activity. From these tables volleyball compared quite favorably, ranking second in Table II by .01 point, and first in Table I by a difference of 5.06 percentage. This indicates a definite recreational interest in volleyball.

However, let us note the comparison with both dual and individual activities. Typical activities have been selected.

TABLE III

PERCENTAGE BY YEARS PER ACTIVITY, PER MONTH, PER ENTIRE PERIOD. 8,278 RECREATIONS

| Activity | 1935 | 1936 | 1937 | 1938 | No Date | Nov. | Per Entire Period |
|---|---|---|---|---|---|---|---|
| Badminton | Zero | .43 | 21.93 | 43.86 | 33.77 | 16.67 | 2.75 |
| Handball | Zero | 1.49 | 34.33 | 16.41 | 47.76 | 21.49 | 4.05 |
| Social Dancing | 4.43 | 6.60 | 28.30 | 12.17 | 48.49 | 18.20 | 11.60 |
| Tennis | .84 | 3.72 | 27.50 | 18.40 | 49.73 | 19.70 | 15.89 |
| Archery | 9.23 | 23.07 | 9.23 | 6.16 | 52.31 | 15.38 | .79 |
| Swimming | 1.56 | 1.63 | 22.43 | 22.21 | 52.16 | 1.35 | 17.02 |
| Skating | 5.73 | Zero | Zero | 60.51 | 33.76 | Zero | 1.79 |
| Tap | 1.11 | 1.11 | 23.33 | 21.11 | 53.33 | Zero | 2.17 |
| Volleyball | .90 | 6.46 | 26.47 | 19.85 | 46.32 | 9.46 | 8.03 |

In this comparison of volleyball, a highly organized team game, with certain dual activities, second place resulted in 1935, 1938, with first ranking in 1936, 1937. Compared with individual activities, the same result was found except for 1938 at which time volleyball ranked third.

Singling out a month at random, November, the percentages for dual activities indicate these particular ones outranking volleyball. Individual acivities, however, in one instance only, archery, topped volleyball for the month of November. These same facts are true when comparing the percentages of dual and individual activities of the entire period with the volleyball percentage of the entire period. Volleyball trailed in dual activities, but ranked second in comparison with individual activities.

On the strength of the facts presented by the foregoing tables, the questions previously asked may be answered with a degree of assurance. To the first two, what have we achieved and what is the result, we may safely say that physical education programs most probably have not discarded team game activities for two reasons. First, the physiological value is too great. The inherent fundamentals of climbing, jumping, running, standing, or walking are put into use by most team game sports. Second, a large portion of our college students have need of knowledge and skills of such activities in some capacity in later years. In our institution, that point must be kept in the foreground since we include both the liberal arts and the teacher-training program. It is encouraging to note that as an institutional practice, team game activities have not fared poorly because of innovating theories and practices. The third question, how has volleyball fared in comparison with dual and individual activities, indicates that in no instance did this activity fall below third ranking except in the case of dual activities for the random selection of the month of November. Otherwise it ranked first, second, or third for similar activities and individual activities.

# A Comparison of Two Methods of Teaching Hygiene to College Freshmen

By F. S. KENT, M.D.
*Medical Director*
and H. A. PRENTICE
*Director of Physical Education*
*University of Vermont*

## INTRODUCTION

SOME eight years ago, like many other institutions, the University of Vermont faced the problem of introducing a course in personal hygiene for freshman men into an already crowded curricula. It was deemed advisable at that time to take the number of hours necessary for the course from the regular periods in physical education. Therefore a period of eight hours of lecture work was established for the course and taken during the regular physical education class period. With an average of approximately 230 freshman men divided up among three colleges, and further subdivided into different curricula within the colleges, sectioning for hygiene classes became a major problem. Each year, after much trouble, six sections of some thirty to fifty men per section were arranged, meeting one hour a week for eight consecutive weeks. For seven years the Medical Director of the University conducted the class on an orthodox lecture discussion basis. By the nature of the students' hour plans and the disposition of the Medical Director's time, it was necessary for the six classes to meet on two consecutive days of the week. It was found that a schedule of this nature was unsatisfactory as far as the efficiency of the teaching of hygiene was concerned. The field of hygiene is too broad to cover in eight hours at the best. The lecture program for the Medical Director during the two days was strenuous, and the students exhibited a surprising lack of interest in this vital work.

This year, in view of the existing situation with its complexities and difficulties, it was decided, if possible, to improve the course. It was found that the nature of the situation did not permit an expansion of the hours allotted, a rearrangement of the schedule of classes, or a grouping into larger units. Therefore, it was decided to increase the efficiency of the course in the hours already allotted. The medium of the motion picture was selected as the means of experimentation.

## PROCEDURE

Investigation showed that there were sufficient films of good quality to construct an adequate eight-hour course. Teaching personal hygiene entirely by motion pictures had never been tried before in this section

and the results were anticipated with interest. The new plan was organized and given during the first semester of the college year 1938–39. The University has excellent facilities through its Fleming Museum for exhibiting motion pictures. It was necessary for the Medical Director to secure the films which constituted the course. All films were previewed and placed in their correct sequence. In view of the fact that it was an experiment, the course under both methods was planned to cover the same general material, in the same number of hours and with comparable examinations.

The general plan of the course in the past years has included ten principal topics. To present the ten it was necessary to combine the ten topics into the following seven units:

| *Title of Unit* | *Motion Pictures Used* |
|---|---|
| 1. Biology and Reproduction | Gift of Life Series No. 3 & 4[1] |
| | *Reproduction in Mammals[2] |
| 2. Muscles and Bones | Posture[3] |
| | Body Framework and Muscles[3] |
| 3. Nutrition and Digestion | *Digestion[2] |
| | *The Alimentary Tract[2] |
| 4. Nerves and Respiration | Breathing[3] |
| | *The Mechanism of Breathing[2] |
| | *The Mechanism of the Nervous System[2] |
| 5. Circulation and Circulatory Control | The Heart and Its Valves[4] |
| | Circulatory Control[3] |
| | *The Heart and Circulation[2] |
| 6. Disease Prevention and Immunity | *Body Defenses against Disease[2] |
| | *Science in Modern Medicine[1] |
| | Gonorrhea and Syphilis in the Male[1] |
| 7. Properties and Uses of Alcohol | *Ethyl Alcohol—Its Properties and Uses[5] |

In each of the silent films, by means of microphonic attachment, the instructor gave a running comment on the salient points to be emphasized. The first hour was devoted to describing the nature of the course and giving a broad outline of the subjects to be covered. In the subsequent hours the pictures were exhibited and a ten-minute question period allowed at the end of the hour. A mimeographed script in brief outline form was handed to each student. At the end of the course an examination was given, comparable in difficulty if not more difficult than the one given under the lecture method. Both examinations were

* Sound film.
[1] American Social Hygiene Association, New York, 1937.
[2] Erpi Classroom Films, Inc., Long Island City, N. Y., 1938.
[3] Eastman Classroom Films, Inc., Rochester, N. Y., 1937.
[4] The American Heart Association, New York, 1937.
[5] National Y. M. C. A., New York, 1938.

objective type, requiring true-false answers, sentence completion, and matching.

## SUMMARY OF FINDINGS

Table I gives the data on the two examinations. The results from the teaching by motion pictures are consistently better throughout, showing fewer failures and better marks. In the judgment of the Medical Director, the 1939 examination was more difficult, although the results were better. Analysis of curves constructed from the results of the two examinations shows the same conclusions. Therefore, it can be concluded that our students secured better marks where they were taught by the use of motion pictures than they did by the orthodox verbal method. From this it might be argued, in view of the better marks, that students retained knowledge better and thus improved the transfer of the knowledge of hygiene into effective action.

Another interesting conclusion resulting from a study of the two methods has to do with the interest on the part of the students. Student comments generally were very favorable when asked if the course were interesting. Further evidence of interest is indicated by the fact that there were less absences from hygiene classes for 1939 as compared with 1938. In 1939, 2.3 per cent absences were noted while there were 5 per cent absences in 1938. A gain of 2.7 per cent, in view of their statements, clearly shows the trend of interest.

Under the system necessary to schedule hygiene classes at Vermont, it was found that the teaching was far easier on the Medical Director than the orthodox method. The teaching by motion picture not only was physically easier, but it saved considerable time in preparation of lecture outlines, as scripts were provided with the films.

## CONCLUSIONS

The results from this experiment in the teaching of hygiene are significant but not conclusive. If teaching is more effective by the use of motion pictures, it possesses significance for all schools throughout the country where hygiene is given. State departments of education can render much assistance by providing the equipment on a portable basis, and thus spread hygiene instruction throughout all schools in a very effective manner.

The consensus of opinion by the staff at the University of Vermont shows that motion pictures possess great possibilities in many different ways. The meagre returns from one year's study justify further experimentation, and this will be done in the year 1939-40. Only by accumulating more evidence can results be made conclusive. The judgment of the facts to date point out three significant conclusions:

1. Teaching of hygiene by motion pictures shows approximately 4 per cent average improvement over the orthodox verbal method.

2. Student interest is much keener in the subject material of hygiene when taught by motion pictures.

3. The problem of providing instruction on an extensive scale is simplified, thus aiding in an important administrative problem.

Further refinement of the technique in teaching by motion pictures will probably show even more substantial results. Also, as hygiene motion pictures are made better by the producers will the teaching of hygiene improve by this medium.

TABLE I

COMPARISON OF EXAMINATION RESULTS

| Taught by Orthodox Lecture Method 1938 Examination | | Taught by Motion Pictures 1939 Examination | |
|---|---|---|---|
| Grades | Number | Grades | Number |
| 94 | 0 | 94 | 2 |
| 92 | 1 | 92 | 0 |
| 90 | 1 | 90 | 5 |
| 88 | 1 | 88 | 1 |
| 86 | 4 | 86 | 5 |
| 84 | 6 | 84 | 11 |
| 82 | 13 | 82 | 16 |
| 80 | 10 | 80 | 13 |
| 78 | 15 | 78 | 18 |
| 76 | 18 | 76 | 24 |
| 74 | 27 | 74 | 27 |
| 72 | 24 | 72 | 15 |
| 70 | 24 | 70 | 20 |
| 68 | 18 | 68 | 15 |
| 66 | 13 | 66 | 12 |
| 64 | 15 | 64 | 8 |
| 62 | 9 | 62 | 4 |
| 60 | 6 | 60 | 3 |
| 58 | 5 | 58 | 1 |
| 56 | 1 | 56 | 1 |
| 54 | 2 | 54 | 6 |
| 52 | 2 | 52 | 0 |
| $N_{'38} = 215$ | | $N_{'39} = 205$ | |
| $M_{'38} = 71.84$ | | $M_{'39} = 74.43$ | |
| $\sigma_{'38} = 7.2$ | | $\sigma_{'39} = 7.84$ | |
| $\sigma M_{'38} = \pm .49$ | | $\sigma M_{'39} = .55$ | |
| One sigma = 64.64 ⇄ 79.04 | | One sigma = 66.59 ⇄ 82.27 | |

# The Sociological Contributions of Physical Education to the Needs of the Negro

By William M. Bell
*Director of Physical Education*
*Florida Agriculture and Mechanical College*
*Tallahassee, Florida*

MUCH has been said and written in recent years concerning the American Negro problem. The 1930 census indicates that practically one-tenth of the population of the United States, or 12,000,000 individuals, are members of the black race. A brief historical review reveals that those persons were introduced into America in large numbers with the beginning of "black slavery" in 1619.

The black man came to this country with neither diamonds nor gold, but brought with him a wealth of physical power, folklore, music, magic, and the results of centuries of animistic practices. The folklore and music is unique within itself in that it is neither entirely African nor American, but a blend of both. He has interwoven his song and rhythm into every phase of his life—in work and play as well as religion. Today he is looked upon as being exceptionally rhythmical, expressing himself in a way that is peculiar to his race. He has long been known for his spirituals, but added to that today is his mastery of "jazz" or "swing." Both forms of music are simple creative expressions of the race arising out of the emotions.

The transportation of the Negro from his native environment brought with it many health and social adjustment problems. Although only the strongest Africans obtainable were brought to America, they were exposed to new diseases and health hazards for which their bodies had built no resistance. Respiratory diseases caused and still cause a disproportionate number of deaths among Negroes. The great difference in racial stock, together with his previous condition of servitude, has helped to magnify the social problems.

There were more than 3,000,000 slaves emancipated in 1863.[1] Most of these people were illiterate and without either economic security or training for citizenship in the American society, one of the most complex in the world. This fact alone with the reconstruction of the South caused the Negro to be greatly retarded in many ways. In spite

---

An abstract of a thesis submitted as a partial requirement for the Master of Arts degree, The Ohio State University, 1938.

[1] Benjamin Brawley, *A Short History of the American Negro*, (New York: The Macmillan Company, 1931) p. 118.

of the numerous handicaps, he has made considerable progress in art, literature, science, and in several fields of endeavor since his emancipation. Today, however, the Negro problem is of fundamental significance to the American society. There is an increasing wave of interest on the part of thinking Americans who are looking for new techniques which will lead toward a satisfactory solution. Where a people constitute one-tenth of a nation's population, it would be unwise for its cultural, social, economic, and religious developments to go unnoted. For, if the culture of any group is to be advanced to its maximum, each component that constitutes that group must concomitantly be advanced.

Science has discovered that the black man's needs are fundamentally and biologically the same as those of any other man. His appetites, pleasures, and pains are common to all human beings. Therefore, if the race problem is going to be solved it will be worked out largely through education—education of whites, blacks, and others to understand these facts and the soundest methods to be used in dealing with them.

Modern programs of physical education are such that there is a manifest need for exploring the possibilities of these programs as aids in the improvement of the social adjustment and physical status of the Negro. A program adequate to meet his requirements cannot be determined until there is a clear understanding of the basic factors which have caused the above mentioned maladjustments. Further, the solution of the Negro problem cannot be attained without adequate provisions for physical education. It is not suggested that this is a panacea. However, it is recognized that if supported by adequate nurture, physical education does develop stronger bodies, keener minds, and shape fuller and richer lives. The writer, feeling that a great service can be rendered in helping to realize this adjustment, attempts to apply the sociological contributions of physical education to the needs of the Negro, through: (1) a brief historical review and understanding of the Negro's social and biological heritage; (2) an investigation of the characteristics of general education; (3) the sociological implications of physical education; (4) various sources of information relative to his socio-economic status; and (5) an investigation of his health status.

## CHARACTERISTICS OF GENERAL EDUCATION

The modern educator has been made to realize the complexity of our changing society and also that of the changing individual. Education, philosophy, government, and religion are all searching for new truths and larger controls. The world is suffering from a hysteria. Revolutions and wars have terrorized and threatened every civilized nation. If we are going to preserve and protect our centuries of progress, some force will have to redirect our present trends. That direc-

tion will have to come through the course of intelligent and scientific education.

Education is striving to develop: (1) a far-sighted race of people who will foresee a great array of results of an act before it takes place;[2] (2) a representative type of individual—one who expresses the desirable traits of society; (3) desirable interests that will multiply; and (4) a people who can solve their problems, thereby helping to promote a more enriched and more effective social order. The best way to determine the state and quality of one's education is to weigh the extent and nature of his participations in society. The writer attempts to show below how physical education can assist the process of general education.

## SOME OF THE SOCIOLOGICAL IMPLICATIONS OF PHYSICAL EDUCATION

Educators recognize that if education is to carry on as a process of growth and continuous reconstruction of experiences, it will do so only to the extent which it provides for learning through activity. Psychologists have long recognized this fact. Recent leaders in physical education have become aware of this fundamental principle also. Physical education and play activities are used as our first steps in progressive education and socialization of our youth. The immature individuals are guided through simple but impressive and lasting forms of sharing and social participation. In the past the Negro has largely been without benefits of these modern methods of learning. Thus, the assimilation of the Negro into the American society has been difficult. Other factors such as his state of literacy, culture, and social attitudes or discriminations, as shown below, have helped retard this process.

## THE SOCIO-ECONOMIC STATUS OF THE NEGRO

The 1930 Census reports of the United States, as well as the 1935 occupational census[3] conducted by the Works Progress Administration, indicates that the Negro constitutes the lowest economic group of the nation's population. Also, the proportion of Negro females gainfully occupied is much greater than that for any other group. Most of these people are concentrated into a few occupations: namely, agricultural labor, domestic and personal service, and unskilled labor in general. The number of professional and skilled workers has, however, greatly increased since 1910. Among the unskilled and servant groups, particularly in the South, it is evidenced that the Negro is often paid lower wages than the white worker doing the same work. Further, investigations show that the plantation system has perpetuated many

[2] John Dewey, *Democracy and Education*, (New York: The Macmillan Co., 1928) p. 128.

[3] Alba M. Edwards, "The Negro as a Factor in the Nation's Labor Force," *Journal of the American Statistical Association*, 31: 195 (Sept. 1936) 529.

of the evils of slavery in tenant farming and sharecropping.[4] These conditions have caused unrest among Negroes and there is a great turn-over in the lower labor group and a constant migration from the agricultural regions to southern and northern cities.

Negro housing offers several problems.[5] The economic disability, segregative legislation and agreements, high rents, and lack of training have caused Negroes to live in slum sections, near railroads, factories, in alleys or near swamps, and in other undesirable districts. Often their homes are overcrowded and the area in which the homes are located are infected with crime and vice. Those who are able to live in the better districts are often kept out.

The above stated influences, such as the Negro's low earnings, racial prejudice, his crowded living conditions, and ignorance, together with the fact that a large number of mothers are out of the home at work, have contributed largely to his disproportionately high rate of crime and juvenile delinquency.[6] It is noted further that organized recreation as such for him has received little attention. Under the proper supervision and in the proper environment, physical education (and organized recreation) since it offers so many opportunities for socialization, may prove to be valuable in reducing this high crime and delinquency rate.

According to the 1930 census, 16.3 per cent of the Negro population as compared with 4.3 of that for the nation were illiterates. Three-fourths of all Negroes live in the South and the District of Columbia where separate schools are maintained. Unequal distribution of funds, short school terms, poor school houses and equipment, inadequate transportation facilities, and a lack of proper understanding of the value of education are some of the handicaps which contribute to the high state of illiteracy.[7]

The 1930 mortality rates among Negroes was 18.0 per 1,000 as compared with 9.9 for whites.[8] The Metropolitan Life Insurance Company reports that organic heart disease was the leading cause of death among its colored industrial policy holders in 1931.[9] Further, tuberculosis and nephritis ranked second and third. Another significant fact is that the death rate due to venereal diseases has been going up since 1919. It is obvious that the movement for the control of the disease must concentrate more attention on the Negro.[10] These high rates

[4] Charles S. Johnson, *Shadow of the Plantation* (University of Chicago Press, 1934) p. 126.

[5] *The President's Conference on Home Building and Home Ownership*, (Washington, D. C.: Government Printing Office, 1932) pp. 33-34.

[6] Willis Duke Weatherford, *Race Relations*, p. 432.

[7] The United States Department of the Interior, Office of Education, Bulletin 121980, "Certain Facts About the Education of Negroes," 1-4.

[8] L. I. Dublin, "The Health of Negroes," Metropolitan Life Insurance Co., p. 4.

[9] *Ibid.*, p. 6.

[10] H. H. Hazen, "A Leading Cause of Death among Negroes," *The Journal of Negro Education*, (July 1937) p. 321.

result largely from economic disability, poor environmental and housing conditions, malnutrition, occupational hazards, insufficient distribution of medical care, lack of adequate guidance, lack of preventative agencies, illiteracy, ignorance, and superstitions.[11]

## CONCLUSIONS

On the basis of the accumulated information, the writer attempts to show that physical education, while not a panacea for the Negro's many ills, can contribute toward his social adjustment, and therefore he suggests the following:

1. Because of nis social heritage, and present economic and social oppression, discrimination, and segregation there is great need for a consciousness of belonging to the American society. There is a need for the feeling of social recognition and approval through participation in activity; there is a need for the feeling of mastery, success, and a definite progress in activity; there is need for opportunity to gain varied experiences; there is need for further development of judgment and insight into human nature and social acts; and there is need for the challenging of his imagination and the competition of his wits.

2. It seems that many worth-while contributions toward decreasing the high rate of juvenile delinquency and crime and developing a well integrated and socialized personality under proper conditions result from participation in various physical education activities and good contacts with other individuals. Physical education offers numerous opportunities for individuals better to understand human nature. It is in this human laboratory that the teachings through physical education and recreation can develop the "likes" of society, such as: unselfishness, cooperation, fair play, justice, honesty, truthfulness, greater interest in social progress, and in general, good character and personality traits, for socialization comes through desired democratic participation.

3. There is need for professionally trained leaders who have an understanding of the Negro's needs, a knowledge and technique for applying this information in the formation of a physical education program based in part on his pantomime, pageantry or folklore, creative music, rhythm or dancing, and carrying it to the darkest hills of America. This can be done through various state agencies and the church.

4. It is the writer's firm conviction that physical education in the broad sense—organized and free play, recreation and athletics, as sponsored through various agencies, namely, Boy Scout and Girl Scout organizations, Y.M.C.A. and Y.W.C.A. programs, school programs, recreational camps, police and other boys' clubs, and numerous similar agencies—with added emphasis, satisfies the particular need of the Negro.

---

[11] Ambrose Caliver, United States Office of Education, *The Fundamentals in the Education of Negroes*, Bulletin 1935, No. 6, (Government Printing Office) pp. 38–39.

5. Because of the health status of the Negro as revealed by the most reliable statistics available, the writer feels that these facts indicate the need for improved health conditions. It is also felt that physical education can contribute to the health needs of the Negro by offering instruction in matters pertaining to his health; by making available activities that will contribute to his organic and mental health; and by the utilization of physical education leadership in matters concerning the health of the Negro.

In the light of the above conclusions it seems likely that physical education can contribute toward these needs or to some of them in aiding the Negro to attain social adjustment and thereby contribute to a fuller and richer life and a better world in which to live.

# Sports Interests and Attitudes of Students Enrolled in the Service Curriculum in Physical Education at the University of Illinois

By H. W. Craig
*Associate in Physical Education*
*University of Illinois*

In THE fall of 1937, the following questionnaire study was undertaken in cooperation with the National Youth Administration. The study was designed along both general and specific lines, its purpose being to discover, if possible, something about the sports interests and attitudes of the students currently registered in the two-year required program at the University of Illinois.

The questionnaire is divided into three parts. First, there is the section devoted to responses indicating what students thought of courses which they had already taken. Secondly, in an attempt to discover the relative importance of sports offered in the curriculum, and to discover approximately how many students it would be necessary to provide classes for, it was asked that the student indicate four of the enumerated activities in their order of importance to him. The third point of the inquiry deals altogether with student attitudes.

Proceeding to an examination of Table I, the response to the question, "Check your reaction to courses which you have taken," it is immediately apparent that with a few exceptions the responses are not sufficient to constitute a basis for any definite conclusions. This failure to get an adequate response can be traced to the fact that in the first semester the preponderance of students are freshmen who have not as yet completed any courses. It is apparent, however, that the majority of students did enjoy their courses.*

One surprising response was the reaction to tap dancing, which 27 per cent of students did not like, and to which 40 per cent were indifferent. The only explanation which can be offered is that the instructors must have fallen down in their presentation or their methods of selling this activity.

Table II, it is believed, is rather an accurate index of student interests in sports offered in the service curriculum. Here the response is complete and any conclusions have the weight of the opinion of all students participating in this project. Certain factors influence the rel-

*An average of 79 per cent.

## INQUIRY BLANK FOR STUDENTS IN THE SERVICE CURRICULUM

Class: Freshman ( ) Sophomore ( ) Junior ( ) Senior ( )
(Please answer as carefully as possible. Ask instructor, if question is not clear)

| Courses | Check your reaction to courses which you have taken: Enjoy | Indifferent | Dislike | If you had free choice at registration, which course would you take? Indicate *four*, in order of importance, i.e., 1, 2, 3, 4 |
|---|---|---|---|---|
| Adapted Sports | | | | |
| Special Sports | | | | |
| Badminton | | | | |
| Volleyball | | | | |
| Begin. Swimming | | | | |
| Indiv. Tumbling Stunts | | | | |
| Dble. Tumbling Stunts | | | | |
| Apparatus Stunts | | | | |
| Boxing | | | | |
| Wrestling | | | | |
| Foil Fencing | | | | |
| Soccer | | | | |
| Golf | | | | |
| Tennis | | | | |
| Softball and Skating | | | | |
| Tap Dancing | | | | |
| Clog Dancing | | | | |
| Individual Athletics | | | | |
| Circus Stunts | | | | |
| Advanced Circus Stunts | | | | |
| Group Sports | | | | |
| Advanced Swimming | | | | |
| Lifesaving and Diving | | | | |
| Water Polo and Ice Hockey | | | | |
| Handball | | | | |
| Squash | | | | |
| Archery | | | | |
| Sabre and Epee Fencing | | | | |
| Bowling | | | | |
| Leisure Sports | | | | |

### QUESTIONS

1. Do you expect to make use of the activities in which you have received credit? Yes.... No....

2. If you do not, do you feel that you have received something of value from the broadening of your point of view in sports, or in the appreciation of sports? Yes.... No....

3. What were your primary motives in registering in your current course? (Check one of the following)

*a*) Curiosity to learn what the activity is like ( ).
*b*) Desire to improve a skill you already possess ( ).
*c*) To get registered as quickly as possible ( ).
*d*) Proximity of physical education course to previous class, or class following physical education ( ).
*e*) Reputation and personality of instructor ( ).
*f*) Desire to take something "soft" ( ).
*g*) Because a friend has told you it was a good course ( ).
*h*) Because your first choice was closed ( ).

4. Which aspects of your courses possessed the greatest appeal to you? (Check one of the following)

*a*) Rules ( ). *e*) Term papers ( ).
*b*) Techniques ( ). *f*) Examinations ( ).
*c*) Competitions ( ). *g*) Demonstrations ( ).
*d*) History and general information( ).

5. What do you regard as the most important benefit to be derived from your physical education courses? (Check one of the following)

*a*) Joy of playing ( ). *d*) Knowledge of rules and techniques ( ).
*b*) Exercise ( ). *e*) Appreciation of sports ( ).
*c*) Muscular development ( ). *f*) Become a skilled performer ( ).

6. To what extent has outside reading in sports and recreation broadened your interests? (Check one) Considerable ( ) Little ( ) None ( ).

7. Do you approve of the graduation requirements in physical education? Yes.... No....

8. Have you taken any proficiency examination? Yes.... No....

9. Would you be interested in a cultural course in the history and appreciation of sport which would consist of films, slides, lectures and demonstrations of sports? Yes.... No....

10. Would you be interested in these proposed courses: Social Dancing, Hiking, Touch Football, Bait and Fly Casting? If you are, which one interests you most? .....

11. Do you feel that Sports Education would be a more appropriate name for what we now call Physical Education? Yes.... No....

---

ative position of some of the activities. For example, the fact that the University of Illinois has one of the finest skating rinks in the country doubtless has considerable influence on the second place standing of the combined course "Softball and Skating."

Certain other courses have just been introduced. Among these are badminton, archery, and leisure sports. A later survey would undoubtedly show a difference in the relative standings of the activities. However, it is evident that the college student prefers to learn activities which are high in carry-over values. The individual sports rank higher in practically all cases than do the team sports.

On the college level, therefore, it does not seem necessary to guide and direct the student's interests along certain lines. If the activities are available, he can be relied upon to make sound choices.

Table III indicates certain rather surprising attitudes. Note that in the responses to questions 1 and 2 we arrive at a figure of 97 per cent of all students who either expect to make use of the activities they are taking or did get something of value out of their sports courses whether they plan to continue those activities or not. This calls attention to that rapidly increasing phase of physical education called sports appreciation.

Questions 3, 4, and 5 were the most difficult to frame. There is no doubt now that certain things which should have been included were left out. Nevertheless, some responses were illuminating. In

question 3, 87 per cent of all responses were divided between questions *a*, *b*, and *h*. The fact that 23 per cent of the students were not able to get the course of their first choice does not, however, represent such a bad situation as it may first appear, for the student has three other semesters in which to elect that activity.

TABLE I

REPLIES TO QUESTION, "CHECK YOUR REACTION TO COURSES WHICH YOU HAVE TAKEN"

| | | | | | Percentage | | |
|---|---|---|---|---|---|---|---|
| Courses | Enjoy | Indif-ferent | Dislike | Total | Enjoy | Indif-ferent | Dislike |
| Adapted Sports | 46 | 45 | 20 | 111 | 41 | 40 | 19 |
| Special Sports | 5 | 8 | 2 | 15 | 34 | 53 | 13 |
| Badminton | 62 | 3 | 1 | 66 | 94 | 4 | 2 |
| Volleyball | 97 | 10 | 7 | 114 | 85 | 9 | 6 |
| Begin. Swim. | 233 | 50 | 17 | 300 | 78 | 17 | 5 |
| Indiv. Tumb. Stunts | 53 | 14 | 15 | 82 | 65 | 17 | 18 |
| Dble. Tumb. Stunts | 13 | 6 | 1 | 20 | 65 | 30 | 5 |
| Apparatus Stunts | 32 | 15 | 7 | 54 | 59 | 28 | 13 |
| Boxing | 123 | 10 | 2 | 135 | 92 | 7 | 1 |
| Wrestling | 218 | 21 | 7 | 246 | 89 | 9 | 2 |
| Foil Fencing | 104 | 22 | 8 | 134 | 78 | 16 | 6 |
| Soccer | 114 | 15 | 3 | 132 | 87 | 11 | 2 |
| Golf | 48 | 6 | 1 | 55 | 88 | 11 | 1 |
| Tennis | 142 | 22 | 4 | 168 | 85 | 13 | 2 |
| Softball and Skating | 227 | 13 | 2 | 242 | 94 | 5 | 1 |
| Tap Dancing | 30 | 36 | 24 | 90 | 33 | 40 | 27 |
| Clog Dancing | 29 | 8 | 6 | 43 | 69 | 18 | 13 |
| Indiv. Aths. | 47 | 29 | 18 | 94 | 50 | 31 | 19 |
| Circus Stunts | 22 | 9 | 4 | 35 | 63 | 26 | 11 |
| Adv. Circus | 4 | 2 | 0 | 6 | 67 | 33 | 0 |
| Group Sports | 47 | 15 | 3 | 65 | 73 | 23 | 4 |
| Advanced Swim. | 139 | 29 | 9 | 177 | 72 | 16 | 12 |
| Lifesaving and Diving | 16 | 1 | 2 | 19 | 85 | 5 | 10 |
| Water Polo and Ice Hockey | 36 | 1 | 0 | 37 | 98 | 2 | 0 |
| Handball | 106 | 5 | 3 | 114 | 93 | 5 | 2 |
| Squash | 19 | 1 | 0 | 20 | 95 | 5 | 0 |
| Archery | 11 | 2 | 0 | 13 | 84 | 16 | 0 |
| Sabre and Epee Fencing | 13 | 2 | 2 | 17 | 78 | 11 | 11 |
| Bowling | 9 | 1 | 0 | 10 | 90 | 10 | 0 |
| Leisure Sports | 4 | 2 | 0 | 6 | 66 | 33 | 0 |
| Average of all courses | 69 | 13 | 5 | 87 | 79 | 16 | 5 |

In reply to question 4, as might be assumed, competitions and acquisitions of skills drew the greatest number of responses.

The fact that the answers to *b* of question 5 drew such a large response is indicative of the need for continued education in the fact that exercise is not the primary purpose of sport.

The response to question 7 was surprising for it is generally known

that college students resent being required to take courses. Yet here, 71 per cent of the students felt that the two-year physical education requirement was quite proper.

The responses to question 10 indicate the widespread interest in

TABLE II

RESPONSE TO THE QUESTION, "IF YOU HAD FREE CHOICE AT REGISTRATION WHICH COURSES WOULD YOU TAKE? INDICATE FOUR IN ORDER OF IMPORTANCE TO YOU"

| Courses | Order of Interest as Indicated by Aggregate of Choices | Total Number of Choices 1, 2, 3, 4 | First Choice | Second Choice | Third Choice | Fourth Choice |
|---|---|---|---|---|---|---|
| Tennis | 1 | 1420 | 418 | 417 | 322 | 263 |
| Softball and Skating | 2 | 960 | 266 | 263 | 237 | 194 |
| Bowling | 3 | 878 | 176 | 205 | 249 | 248 |
| Golf | 4 | 832 | 251 | 214 | 202 | 165 |
| Boxing | 5 | 781 | 203 | 229 | 175 | 174 |
| Wrestling | 6 | 665 | 181 | 176 | 175 | 133 |
| Advanced Swimming | 7 | 717 | 252 | 179 | 152 | 134 |
| Handball | 8 | 642 | 132 | 122 | 186 | 202 |
| Begin. Swimming | 9 | 592 | 259 | 125 | 96 | 112 |
| Badminton | 10 | 563 | 114 | 142 | 152 | 155 |
| Volleyball | 11 | 498 | 91 | 126 | 140 | 141 |
| Foil Fencing | 12 | 462 | 139 | 117 | 111 | 95 |
| Lifesaving and Diving | 13 | 345 | 73 | 93 | 81 | 98 |
| Tap Dancing | 14 | 343 | 47 | 85 | 90 | 121 |
| Archery | 15 | 310 | 37 | 55 | 99 | 119 |
| Water Polo and Ice Hockey | 16 | 295 | 71 | 72 | 77 | 75 |
| Soccer | 17 | 278 | 59 | 66 | 83 | 70 |
| Indiv. Tumbling | 18 | 219 | 55 | 54 | 48 | 62 |
| Sabre and Epee Fencing | 19 | 150 | 11 | 53 | 31 | 55 |
| Leisure Sports | 20 | 145 | 19 | 20 | 26 | 80 |
| Apparatus Stunts | 21 | 143 | 34 | 29 | 45 | 35 |
| Individual Aths. | 22 | 129 | 19 | 27 | 40 | 43 |
| Group Sports | 23 | 102 | 14 | 33 | 18 | 37 |
| Double Tumbling | 24 | 70 | 4 | 28 | 16 | 22 |
| Squash | 25 | 68 | 7 | 12 | 24 | 25 |
| Clog Dancing | 26 | 66 | 8 | 17 | 18 | 23 |
| Circus Stunts | 27 | 57 | 12 | 19 | 20 | 57 |
| Adv. Circus Stunts | 28 | 17 | 1 | 4 | 6 | 6 |
| Adapted Sports) Special Sports ) | | | These two courses are designed for physical defectives and are required of them; no rating as to free choice is possible. | | | |

corecreational activities, with over half the total number of students participating in this study indicating their interest in a proposed course in social dancing. Since this questionnaire was given two of the four proposed courses—Touch Football and Bait and Fly Casting—have been added to the curriculum. As yet, Social Dancing has not been introduced because of certain administrative problems in connection

TABLE III

QUESTIONS RELATING TO ATTITUDES

| Questions | Total Number Responses | | Percentage |
|---|---|---|---|
| 1. Do you expect to make use of the activities in which you have received credit? | Yes | 2643 | .80 |
| | No | 646 | .20 |
| 2. If you do not, do you feel that you have received something of value from the broadening of your point of view in sports, or in the appreciation of sports? | Yes | 1577 | |
| | No | 103 | .03 |
| 3. What were your primary motives in registering in your current course? | | | |
| *a*) Curiosity to learn what the activity is like | | 745 | .24 |
| *b*) Desire to improve a skill you already possess | | 1157 | .38 |
| *c*) To get registered as quickly as possible | | 121 | .04 |
| *d*) Proximity of physical education course to previous class, or class following physical education | | 29 | .009 |
| *e*) Reputation and personality of instructor | | 36 | .01 |
| *f*) Desire to take something "soft" | | 28 | .009 |
| *g*) Because a friend has told you it was a good course | | 170 | .05 |
| *h*) Because your first choice was closed | | 704 | .23 |
| 4. Which aspects of your courses possessed the greatest appeal to you? | | | |
| *a*) Rules | | 49 | .01 |
| *b*) Techniques | | 935 | .33 |
| *c*) Competitions | | 1509 | .53 |
| *d*) History and general information | | 145 | .05 |
| *e*) Term papers | | 20 | .007 |
| *f*) Examinations | | 13 | .004 |
| *g*) Demonstrations | | 161 | .06 |
| 5. What do you regard as the most important benefit to be derived from your physical education courses? | | | |
| *a*) Joy of playing | | 803 | .24 |
| *b*) Exercise | | 1156 | .34 |
| *c*) Muscular development | | 481 | .14 |
| *d*) Knowledge of rules and techniques | | 270 | .08 |
| *e*) Appreciation of sports | | 272 | .08 |
| *f*) Become a skilled performer | | 343 | .10 |
| 6. To what extent has outside reading in sports and recreation broadened your interests? | Consid. | 1080 | .33 |
| | Little | 1575 | .48 |
| Considerable Little None | None | 588 | .19 |
| 7. Do you approve of the graduation requirements in physical education? | Yes | 2344 | .71 |
| | No | 933 | .29 |
| 8. Have you taken any proficiency examinations? | Yes | 707 | .30 |
| | No | 2350 | .70 |
| If so, how many did you pass? | Passed(1) | 459 | .65 |
| | Passed(2) | 50 | .07 |
| | Passed(3) | 11 | .01 |
| How many did you fail? | Failed | 155 | .22 |

| Questions | | Total Number Responses | Percentage |
|---|---|---|---|
| 9. Would you be interested in a cultural course in the history and appreciation of sport which would consist of films, slides, lectures and demonstration of sports? | Yes | 1827 | .55 |
| | No | 1446 | .45 |
| 10. Would you be interested in these proposed courses: Social Dancing, Hiking, Touch Football, Bait and Fly Casting? If you are, which one interests you most? | Soc. Danc. | 1622 | .53 |
| | Hiking | 204 | .08 |
| | Tch. Football | 674 | .22 |
| | Bait-Fly Casting | 518 | .17 |
| 11. Do you feel that Sports Education would be a more appropriate name for what we now call Physical Education? | Yes | 1877 | .56 |
| | No | 1323 | .44 |

with its installation. But indications are that, in the near future, there will be a course offered.

In conclusion, we can safely assume from the above results that given a broad and well organized program in sports, the average college student will (*a*) select activities high in carry-over values and (*b*) will enjoy taking them. In the greater percentage of cases he expects to make further use of the activities he takes, but even where he does not expect to continue participating he feels that his courses were worth while. Curiosity about a sport and the desire to improve a skill already possessed are the student's motive in entering his courses. He believes that exercise and joy of playing are the most important benefits he can derive from physical education.

In short, the average college student shows a good balance of ideas concerning sport and can be properly allowed to exercise his own judgment in such matters.

# Effect of the Elimination of the Center Jump on the Game of Basketball

By Wilho Frigard
*Instructor in Physical Education*
*Massachusetts State College*

THIS study was undertaken in an attempt to make a definite, objective comparison between the type of basketball played under the old rules and the type resulting from the elimination of the center jump after field goals. The writer was of the opinion that in the controversy concerning the elimination of the center jump in the game of basketball, a great majority of the criticisms in favor of or in opposition to the change was entirely subjective and based chiefly on the reactions of players, coaches, and spectators. With this in mind, the writer decided to attempt an impartial, objective comparison of games under the old and the new rules.

The items which would lend themselves to purely objective comparison, eliminating subjective observations and reactions, included shooting and scoring, actual playing time, number and types of interruptions of actual play, and the time of these interruptions.

Comparisons in the above mentioned items under the two types of rules were made possible by the fact that data of this nature were already available in connection with the Western Massachusetts Small High School Basketball Tournament which was held at the Massachussets State College in March, 1934. A collection of data was made in connection with the 1938 Tournament; and since the latter was played under the new rules, comparisons were possible in these items in the two types of games.

Summaries of some of the interesting figures collected in connection with this study are presented in this article. Before any conclusions are made, however, the writer wishes to indicate that the results obtained and the conclusions made are by no means considered as absolutely conclusive evidence of the differences between the two types of basketball, for the reason that the study was limited to high school basketball played in Western Massachusetts, and more particularly to the basketball played by the teams competing in the 1934 and 1938 Massachusetts State College Tournaments. It is the wish of the writer that this study be considered but a beginning along this line of research.

From a study of Table I, it will be seen that as far as actual playing time is concerned, there is very little difference between the two

The data in this paper are from a thesis submitted in fulfillment of the degree of Master of Science, Massachusetts State College, 1938.

types of basketball. The figures show that with the new rule in effect in 1938, there was an increase in actual playing per game of only 18.4 seconds over 1934, when the center jump was still part of the game.

TABLE I
ACTUAL PLAYING TIME

| | 1934 | 1938 |
|---|---|---|
| Total number of playing periods* | 1,111 | 1,188 |
| Average number playing periods per game | 111.1 | 118.8 |
| Average number of playing periods per quarter | 27.8 | 29.7 |
| Total actual playing time for ten games | 226 min., 44.3 sec. | 229 min., 48.5 sec. |
| Average playing time per game | 22 min., 40.5 sec. | 22 min., 58.9 sec. |
| Average playing time per quarter | 5 min., 40.1 sec. | 5 min., 44.7 sec. |
| Average time of playing periods | 12.25 sec. | 11.61 sec. |

* Playing period—Time the ball was actually in play between interruptions (goals, fouls, violations, etc.).

Analyzed a little further, this means that the increase in actual playing time per quarter was 4.6 seconds.

According to the figures in Table II, the time of relaxation (time of interruptions in actual play) was considerably greater in 1938 than in 1934. From the figures given, one would gather that the players had much more time between periods of actual play in 1938 than in the 1934 Tournament. For instance, figures show that the average relaxation time per quarter varied from 4 minutes 28 seconds in 1934 to 9 minutes 27.9 seconds in 1938.

TABLE II
TIME OF INTERRUPTIONS*

| | 1934 | 1938 |
|---|---|---|
| Total time of interruptions | 178 min., 39 sec. | 391 min., 26.7 sec. |
| Average time per game | 17 min., 52 sec. | 39 min., 8.7 sec. |
| Average time per quarter | 4 min., 28 sec. | 9 min., 27.9 sec. |
| Average time of interruptions | 9.82 sec. | 20.11 sec. |

* Excluding time between halves. Interruptions included time between field goals and next play, fouls, out-of-bounds, violations, held balls, time-outs.

Before one makes any conclusions, however, it is important to note that in the 1938 Tournament there were incorporated a few special rules to slow the game down a little and to safeguard the health of the players. After a field goal was scored, the ball was played from the corners rather than from directly underneath the basket. Teams were allowed six two-minute time-outs instead of five.

Table III gives a summary of the type and number of interruptions of actual play.

The increase in the number of field goals indicates an increase in scoring, which will be taken up in greater detail later.

One of the main contentions of the new-rule advocates was that the elimination of the center jump would eliminate many held balls as well. From the figures in Table III, it will be seen that in 1938

there were 5.5 fewer held balls per game than in 1934. In 1938, center jumps occurred only at the beginning of the first and third quarters, or twice per game. In 1934, there was an average of 22.7 center jumps per game. This means that in 1938 the elimination of 20.7 center jumps per game brought about a reduction of 5.5 held balls; which is a reduction of approximately 26 per cent. Whether this figure indicates that this purpose of the new rule has been fulfilled will have to be decided by the reader.

TABLE III

INTERRUPTIONS

| | 1934 | 1938 | | 1934 | 1938 |
|---|---|---|---|---|---|
| Field goals | 167 | 200 | Held balls | 255 | 200 |
| Fouls committed | 157 | 195 | Out-of-bounds | 352 | 342 |
| Violations | 104 | 135 | Time-outs | 36 | 77 |

One of the main contentions of the opponents of the new rule was that the elimination of the center jump would increase the speed of the game to such an extent that the game would turn out to be wild, "racehorse" basketball, with less ball control and more fouling. A study of the figures in Table III shows that in 1938 there was an increase of 3.8 fouls per game over 1934. Whether this increase in the number of fouls per game is significant enough to indicate that the game has become rougher is debatable.

If the violations (most of which were traveling) and the out-of-bounds (which represent the times the ball was thrown or carried out-of-bounds) can be considered as a criterion of how well the ball was controlled, we can go to Table III to study the figures relative to these items. We find that in 1938 there were 3.1 more violations per game than in 1934. Whether this increase can be considered a significant one is questionable. Relative to out-of-bounds, we find that in 1938 there were actually ten fewer such occurrences than in the former year. From these figures, the writer makes his conclusion that the game has not become a "racehorse" type of game.

Another argument presented by opponents of the new rule was that wild shooting would result from the increase in the speed of the game. Figures collected along this line indicate that in 1934, the total shots taken was 1,035, while in 1938 the number of attempts at field goals was 1,095. This means that there were six more shots taken per game under the new rule, which to the writer is a very significant indication that wild shooting has not resulted. To bear out this statement, figures show that in 1934 there were 167 field goals scored out of the 1,035 attempts, for a shooting average of 16.1 per cent; while in 1938 the average was 18.3 per cent, with 200 field goals out of 1,095 attempts.

Relative to the matter of scoring, it is interesting to note some of the figures collected along this line. Table IV indicates some data

collected at the State College Tournaments from 1934 through 1938.

From a study of Table IV, it can be seen that there was a very definite increase in scoring in 1938 over any of the previous years. However, a little further study will show that the increase was not as great as it seems at first glance. The total points scored in 1938 (523)

TABLE IV
SCORING RECORDS, 1934–1938

| | 1934 | 1935 | 1936 | 1937 | Average 1934–1937 | 1938 |
|---|---|---|---|---|---|---|
| Total points scored (ten games)..... | 406 | 410 | 499 | 454 | 442.25 | 523 |
| Average points per game (both teams) | 40.6 | 41.0 | 49.9 | 45.4 | 44.2 | 52.3 |
| Average winner's scores ..... | 26.3 | 23.9 | 28.8 | 26.9 | 26.48 | 29.9 |
| Average loser's scores ..... | 14.3 | 17.1 | 21.1 | 18.5 | 17.75 | 22.4 |
| Average field goals per game (both teams) ..... | 16.8 | 15.3 | 19.4 | 18.4 | 17.48 | 20.0 |

was only 24 points more than were scored in 1936, when the old rule was still in effect. This means that there was an average of but 2.4 more points scored per game in 1938 than in 1936.

Comparison of the scoring records of 54 Western Massachusetts high schools for the years 1936-37 and 1937-38 shows an increase in scoring of 2.4 points per game per team, with the average points scored per game by team being 26.1 in 1936-37 and 28.5 in the latter year.* With an average schedule of 17.5 games per season, the figures mean

TABLE V
SCORING RECORDS OF 54 WESTERN MASSACHUSETTS HIGH SCHOOLS
SEASONS 1936–37 AND 1937–38

| | 1936–37 | 1937–38 |
|---|---|---|
| Average number games per team..... | 17.5 | 17.5 |
| Average number games won..... | 9.3 | 9.1 |
| Average number games lost..... | 8.2 | 8.4 |
| Total points scored (54 teams)..... | 24,649 | 26,958 |
| Average points per season per team ..... | 456.5 | 499.3 |
| Average points per game per team..... | 26.1 | 28.5 |
| Average number field goals per game per team | 10.6 | 11.5 |

that the average points scored per season by each team increased from 456.5 in the former year to 499.3 in 1938.

In summary, the following may be said concerning the two types of basketball:

1. Actual playing time per game has increased very little.

2. Scoring has increased but not to such an extent as to indicate wild shooting.

3. A number of held balls have been eliminated.

4. Figures relative to ball control and fouling indicate that the game has not become less scientific.

* The reader might be interested to know that a study of the scoring records among New England college teams for the same two seasons show an increase in scoring per game per team of 6.7 points.

# A Motion Picture Questionnaire

By Jenny E. Turnbull

*George Washington University;*
*Corresponding Secretary, Motion Picture Committee*
*National Section on Women's Athletics*

DURING July of 1938, the Motion Picture Committee of the National Section on Women's Athletics made a questionnaire study of film libraries. We sought to discover the recent trend in the use of films in the teaching of sports. A questionnaire was sent to thirty-eight state universities to discover not only the use in those particular institutions but also a cross section of the state and nearby areas which those universities serviced. The remaining ten states were represented by forty-three other colleges and universities with an enrollment of more than one thousand students. There was a 59 per cent return of the questionnaire. It was hoped the resulting data would show: (1) the interest in the use of films in teaching, as shown by the ownership and distribution of films; (2) the demand for specific activities; and (3) the criteria set up by various institutions in the purchase of teaching films.

The main purpose of the questionnaire was to obtain information which would encourage the production of educational short subjects for women's activities. As a whole, the films available now are not those designed primarily for teaching purposes but rather for the commercial screen, and these have been adapted for school use. This method of obtaining teaching films has resulted in considerable extraneous matter being coupled with whatever good a film might have. Intelligent preparation with an eye to effective standards would do much to remedy this situation. There is a definite demand for instructional films which, it seems, would increase proportionally with the production and increased availability of appropriate new material.

The demand, as shown by the questionnaire, however, was not as great as was anticipated. It was discovered that although 41 per cent of the returns indicated a department of visual education, only 18 per cent had a sports film library. (The absence of film libraries in some instances was shown to be due not to indifference toward the use of films, but to a variety of reasons. In one case the department had been dispensed with since the depression; in another case objections from commercial houses became too overwhelming to maintain a visual education service; and in some other institutions where there were no film libraries, immediate action was being planned to establish them.) Of the total 59 per cent return, it was shown that there was a 31 per

cent demand for women's sports films. The returns indicated a need for a variety of subjects, which are listed according to their recurrence on the question forms as follows: swimming, hockey, tennis, golf, archery, basketball, badminton, speedball, dance, winter sports, lacrosse, and soccer. A questionnaire in a more restricted area indicated a demand for the same activities.* A great majority of those who answered this same questionnaire also wanted films to rent.

Of the institutions owning films, 45 per cent showed that the majority of films purchased were produced professionally, whereas 16 per cent indicated that they purchased both amateur and professional films. The increase in the use of visual aids has necessitated the setting up of criteria for the selections of films. This indirectly assists those who are promoting amateur film projects. Fifty per cent of the universities evaluate films before purchase, and naturally a great similarity was discovered in the sets of criteria received.†

The three main classifications were listed as (1) objectives, (2) content, (3) technical quality. The reviewing boards were asked to score the following types of questions.

1. Objectives. (*a*) Are they obvious? (*b*) Are they in keeping with the teaching aims at the particular level involved?

2. Content. (*a*) Is it accurate and authentic? (*b*) Is it adapted to modern courses of study and the intended level? (*c*) Does the content need motion to bring about the objectives? (*d*) Does the presentation promote further study? (*e*) Does the film supplement or replace the teacher?

3. Technical quality. (*a*) Is the film clear and steady? (*b*) If a sound film, is the sound reproduction good? (*c*) Is the film pleasing from the point of view of pictorial composition?

Having criteria such as these is not only a guide for the purchase of films but also is a suitable guide for the production of films, either amateur or professional. In our particular field of activity, sports education, the interest in amateur photography is indeed gratifying. Being a specialized area, it is difficult, at the present time, to persuade the big commercial producers that there is any sizeable market which would defray the expenses involved in the making of slow-motion short subjects for teaching women's sports. In motor activities there is much that can be shown only through the medium of slow motion and stopped action—for example, a golf swing at each section of its execution. There is much that can be presented in the way of small detail

---

* Questionnaire submitted to twenty-six Illinois high school teachers by Laura Huelster, University of Illinois, member of the Motion Picture Committee.

† The standards set out in this article constitute a compilation from score sheets received from The University of Arizona, The University of California at Los Angeles, University of Colorado, University of Illinois, University of Indiana, State University of Iowa, University of Kansas, University of Michigan, University of Minnesota, University of North Carolina, the Ohio State University, and West Virginia University.

which is important but extremely difficult to demonstrate adequately before a large class—for instance, the correct grip on a tennis racquet. Another boon of films to physical education teachers is the ability to show the activity as a whole to a group of beginners—for example, a lacrosse game as it should be played, the essence and purpose of the game. In all these objectives the amateur can fulfill to a degree the marked need for effective supplements to teaching in the form of visual aids. In the final analysis, however, the best films are professional ones, done with absolutely the maximum of equipment and technical knowledge, with stress laid on the proper proportion of dramatic quality and continuity which notably enhances the subject matter to be conveyed to the students.

How to get these films is the question. A sufficient demand is bound to bring results. Ask for good teaching films of your rental agency whether it be a state visual education department or a commercial booking house, and enough requests of this sort will inevitably convey the idea of a need for teaching films in physical education for women.

NOTE: The Motion Picture Committee of the National Section on Women's Athletics hopes to obtain from time to time articles on the use of the motion picture as a teaching aid in the field of women's sports. The first article appeared in the October, 1938, *Journal of Health and Physical Education*. We hope they will prove to be of interest and assistance.—Louise S. Kjellstrom, Chairman.

# BOOK REVIEWS

FUNDAMENTALS OF PHYSICAL EDUCATION. George G. Deaver, M.D. (Philadelphia: W. B. Saunders Co., 1939) 299 pages, $2.75.

This interesting book by Dr. Deaver interprets the physical examination and its findings for those persons who are in a position to give advice and guidance in health matters. It provides students, teachers, physical educators, and nurses with a manual that will aid them in recognizing early symptoms of abnormal functioning of the body, in understanding the techniques and medical nomenclature of the physician. The material is organized also to supplement a course of instruction in the fundamentals of the examination, including suggestions on teaching methods, with lessons and laboratory exercises for students.

Beginning with the general considerations of the values of the examination and the respective responsibilities of the teacher, physical director, and nurse, the reader is introduced to the necessary preparation, required equipment, personal history data and progressive steps in the accepted techniques of the physical examination. The methods described include the inspection, palpation, percussion, auscultation, and laboratory tests. Body types and susceptibility to disease, both physical and mental, are followed with a systematic description of the examination of body parts. Among these considerations are mentioned the muscles, posture, spine, abdomen, arms and hands, thighs and legs, feet and toes, skin, height and weight, head and neck, eyes, ears, nose, mouth and throat, respiratory system, circulatory system, digestive system, genito-urinary system, and nervous system.

A related description of the nature of body parts and certain functions pertinent to a good understanding of the examination adds an informative character to the book and provides a pleasant continuity. Normal and abnormal conditions adequately explained and numerous illustrations complete a practical work that should prove to be of immeasurable value in the prevention, detection, and correction of impairments to health.

ROBERT M. GRUENINGER
*Western Reserve University*
*Cleveland*

THE BOOK OF MAJOR SPORTS. Edited by William L. Hughes. (New York: A. S. Barnes and Company, 1938) 396 pages, $3.00.

*The Book of Major Sports* is unique in that it is adaptable to both coaches and players and deals with the basic fundamentals of the four major sports: football, basketball, baseball, and track.

In addition to being a valuable contribution to the experienced varsity coach and the exceptional athlete who wish to exhaust all possibilities, this volume deals with the basic fundamentals and techniques of individual and team play. It is designed especially for coaches of small institutions who are called upon to coach several of the major sports and for athletes desiring to master individual techniques in them. Explanatory diagrams and charts accompany each phase and provide adequate means for studying each technique.

Especially valuable to the athletic coach are the chapters on "Coordinating and Defensive Line" and "Generalship and Strategy" in football written by H. Glenn Killinger; "Footwork Fundamentals" and "Individual and Team

Offense" in basketball, written by Charles C. Murphy; "Pitching," "Base Running," and "Signals and Team Play" in baseball, written by Daniel F. Jessie; and "Coaching Techniques" in track, by Ray M. Conger.

A short introduction preceding each major sport treatise gives an interesting history of the sport, its various developmental phases and its possible contributions to the education of modern American youth.

Such an extensive collection of sports materials compiled in one volume make this book an outstanding contribution to the sports world for coaches, players, and students.

LOWELL G. BIDDULPH
*Director of Physical Education and Athletics*
*Ricks College*
*Rexburg, Idaho*

KEEP FIT AND LIKE IT. Dudley B. Reed, M.D. (New York: McGraw-Hill Book Company, 1939) 319 pages, $2.50.

As Professor of Hygiene and Director of the University Health Service in the University of Chicago, Dr. Reed is in constant touch with people who are rather inclined to neglect physical development to concentrate upon mental attainments. Such people need stimulation. Dr. Reed offers it through his vigorous and witty style. As Dr. Morris Fishbein points out in the book's introduction, "Dr. Reed tells you how to keep fit with fun." Dr. Fishbein even goes so far as to say that he considers this "the most reliable, authentic, and useful book on the subject" that he has ever read.

The author introduces his subject by discussing fairly briefly the fallacy of accepting any one form of exercise or any particular amount of it as good for everybody. He points out the parts that individuality and circumstances play. He emphasizes also the fact that interest in building bodies through physical education is by no means new —it is merely a revival of an interest. "Those ancient connoisseurs of beauty, the Greeks, knew full well the beauty of the body and left us not only the Aphrodite of Melos but the Hermes of Praxiteles. A beautiful body is an asset, and it may not be unworthy to strive to make and keep it so."

In the chapter entitled, "Mainly Mechanical," Dr. Reed presents the subject of the body's functions in a fascinating way. Having made a hurried trip through the factory where energy is created, he then takes time to explain its internal workings—physiological and psychological. When he thus has put his readers in the proper frame of mind, refreshing their memories at the same time, he is ready to deal with individual problems.

"The good life for most people should contain some work and some recreation." What form shall the recreation take? When shall it be taken and in what sized "doses"? Dr. Reed points out the advisability of discussing these questions with one's family physician and having a physical check-up before deciding upon any strenuous course of action.

This done, the recreation chosen may be golf—the game to which skeptical King James succumbed completely; the game that Mary Stuart, one-time-Queen, is said to have played a few days after the murder of her husband. If you choose golf, what kind of a figure will you cut in golf clothing? Will you find sudden death on the golf course? What has golf for you? The author believes it has a great deal to offer.

But so too have such sports as bowling, swimming, hiking, tennis, and other court games. All these forms of healthful recreation are described and discussed by the author in a very helpful way. So too is horseback riding. Twenty pages are devoted to the proper technique of this excellent outdoor exercise.

The chapter on skating is illustrated with many figures, most carefully drawn to show how to get the most of this recreation. One could not help but "like it" if skating were chosen for keeping fit and Dr. Reed's very in-

teresting suggestions were followed on the ice.

When discussing the "value of sports," Dr. Reed talks frankly with his readers about the relationships existing between fathers and sons, mothers and daughters, as he has found it among his college students. To him it seems tragic that so often this relationship is strained. He feels very strongly that it need not be if there had been continued through the years the enjoyment together of some sport not limited to youth—some *common* interest maintained.

In his closing chapter the author gives a "Calendar of Sports by Decades"—a table which is very unique. If you want to see what your parents and their parents before them did for sports and recreation, you will find the answer here. In fact, anyone who is interested at all in physical activities and education will surely want to read this book.

BEULAH FRANCE, R.N.
*New York City*

GAMES FOR RURAL SCHOOLS. Myrtle Yoder Messenger. (Minneapolis: Burgess Publishing Company, 1938) 49 pages, $1.35.

The compiler was formerly grade supervisor of physical education in Fargo, N.D., and has since become director of physical education in Augustana College at Sioux Falls, S.D. The games selected and described have been tested by her and selected for special adaptation to rural schools. For convenience the following are among the groupings for the active games.

Girls and boys, all ages, less than ten players; more than ten players, 74 games.

Girls and boys, grades 1–4 and 5–8, less than ten players, 45 games.

Girls, grades 1–4 and 5–8, more than ten plays, 65 games.

Boys, grades 1–4 and 5–8, more than ten players, 30 games.

It may be noted that the list for girls contains more games than are given for boys.

For "Quiet Games" there are more than fifty descriptions, and finally nearly 100 "Ice Breakers" are outlined.

The introduction contains suggestions relative to procedure and method in teaching games; the descriptions are brief and clear, and the illustrations suggesting floor and ground plans aid in the layout of the necessary play apaces.

This publication is to be commended not only for teachers in rural schools, but also for leaders in all social groups, and is deserving of wide acceptance.

GEORGE B. AFFLECK
*Springfield College*
*Springfield, Mass.*

PHYSICAL EDUCATION IN THE ELEMENTARY GRADES. Strong Hinman. (New York: Prentice-Hall, Inc., 1939) 523 pages, $2.00.

With the present trend in elementary schools of having classroom teachers, rather than special teachers, conduct physical education classes for their own pupils, this book contains invaluable materials. Most classroom teachers have not had the advantage of technical training in physical education, and a book of this type will be of great benefit in helping them to carry on a well-rounded program. Students in training institutions will also find that the book contains a wealth of practical materials which will prove useful in their professional preparation, as well as later when in service.

In the discussion of a modern program of health and physical education, the following three phases of the work have come in for considerable amount of discussion; namely, health service, health education, and physical education.

Under the health service phase of the program, a list of the more essential duties of the school physician, the nurse, and the classroom teacher has been included. Special emphasis has been given relative to ways and means of making morning inspection interesting through the use of various games.

Under the health education phase of the program, stress is placed upon the

development of knowledge, habits, and attitudes which will tend to help pupils live happily.

In the physical education phase of the program, we need skilled leadership, adequate facilities, adequate time allotment, and classification of activities.

The Leaders Club, its purpose and value, how to select leaders, how to train and develop leaders, as well as what to teach them, is thoroughly discussed.

A chapter is devoted to the importance of integration of subject matter with other fields of education and planning the year's program.

A program of minimum essentials for one semester in health and physical education from the kindergarten through the sixth grade, as well as a weekly plan, has been worked out.

For the lower grades, sixty-six story plays have been prepared in outline form. Sixteen story plays to music are given, as well as the number of the phonograph record which works best with that particular story play. In addition, many suggestive titles from which story plays may be created have been included.

Rhythmical activities are an important part of a physical education program. Many singing games and folk dances are fully described under the chapter "Rhythmical Activities." An outline of how to teach these rhythmical activities in order to obtain best results is also included.

Under the chapter on games and relays, emphasis is placed on steps to follow in presenting games, how to maintain interest, formation used in playing games, and methods of counting out and choosing sides. Many games are listed and fully described for the various grade levels.

The athletic games of low organization have been selected for fall, winter, and spring. It is pointed out that the elementary schools should offer an opportunity for pupils to develop fundamental skills in a variety of athletic games, with the hope that these skills will be useful later on.

How to teach conditioning exercises, demonstrations, giving proper commands, observing and correcting faults, methods of counting, and commands used in starting and stopping are fully described. Marching techniques are also described.

Some emphasis is given to various types of corrective exercises, and athletic drills for upper grade boys and girls.

The final chapter deals with stunts, self-testing activities, athletic badge tests, and pyramids and stunts on playground apparatus.

This book should prove to be very valuable to special teachers in physical education, administrators, and especially the classroom teacher, who is so often called upon to teach health and physical education to her own pupils. The author is to be congratulated for presenting his materials in a concise and practical way.

PAUL H. DERR
*Teacher of Physical Education*
*The Laboratory Schools*
*University of Chicago*

DRUMS, TOMTOMS, AND RATTLES. Bernard S. Mason. (New York: A. S. Barnes and Company, 1938) 206 pages, $2.50.

To make its best contribution to society and to the development of children, the summer camp must constantly seek to maintain its original intimate contact with the out-of-doors. Nor can it escape the emphasis which such contact places upon primitive processes and ways of living. Many directors have ignored this fact and have permitted all the pet theories and practices for which the school is now unfitted to creep into the camp program.

Such men would do well to read carefully this book of drums by Bernard S. Mason. It is a study of ancient drums—dancing drums, religious drums, woodsy drums. It is the voice of a drum which is full of memories. "Memories not merely of the time-wrinkled Redman and the mingled odors of smoke-tanned buckskin and sweet-grass that pervaded his bark 'wakinoogan' in the

Pine Land where once it hung, but memories of all ancient and beautiful things of the woods and its people."

Such a drum is alive, vibrant, demanding. It calls us away from the innumerable petty details of modern life and back again to the whole-hearted devotion to the Great Spirit which finds release in the rhythmical throb of dancing feet. For, as Mason so convincingly points out, religious expression is the greatest significance of Indian dancing and of Indian drums. Drums are symbols of the spirit of joy in play and in worship. For of all play activities of primitive peoples, that of dancing is foremost. It fulfills the innate sensitiveness to rhythm which is so basic to all men. And in all dancing it is the drum which controls the rhythm and creates that flow of motion and oneness of feeling which is the very essence of the play spirit.

But the great value of this book is not only to develop the philosophy of drums but to describe their various functions, shapes, and the methods of constructing them. Four types of Indian drums are described: hand drums, large dance drums, log or barrel drums, and water drums. A final chapter tells of dance rattles and other sound makers. It is the author's avowed purpose to describe only authentic drums which are true to the ancient patterns. He does, however, yield in his discussion of each type of drum to the modern demand for time and energy-saving devices and speaks of the use of tin cans and cheese boxes. But he persistently emphasizes the great satisfaction which may be obtained through constructing a drum from original materials. The joy of achievement in dragging into camp a cedar log, of personally splitting out a smooth board for the drum frame; the smell of rawhide and of the sweat which accompanies its cleaning; all seep deeply into the innermost fibers of a drum and swell its voice far beyond the power of machine made substitutes. A drum of tin is a thing to bang. A drum of the woods is an altar before which the camper may worship and dream of ancient days.

Despite the implications of the above paragraphs, the value of this book is certainly not limited to the camping field. Dance groups, music classes, scout troops, playground and recreational leaders of all kinds will find in it both pleasant reading and stimulating suggestions for their work. The numerous illustrations which portray both construction of the drums and authentic ways of decorating them are excellent.

In short, Mason has once again made a distinct and valuable contribution to our knowledge of Indian lore as well as to the more general field of play and recreation. To those who love a somewhat romantic approach to primitive living and to the things of the past; to those who love to make things both beautiful and useful; to those who have use for a rhythm instrument which is both authentic and full-toned; this volume should prove of great interest.

J. KENNETH DOHERTY
*Instructor in Theory and Practice of Athletics*
*University of Michigan*

MORE ABOUT RIDING FORWARD. V. S. Littauer. (Published privately by the author, 1938) 192 pages, illustrated, $3.00.

The author believes that the change from the old-fashioned way of riding a field horse to the modern one is probably the most important movement in the history of equitation that has been steadily growing in America during the last decade.

The main theme of the book is that schooling is the foundation of good performance and should not be regarded as a special branch of horsemanship; its principles should be taught to every rider. In any good system of riding, a certain method of sitting a horse is just an inseparable part of a certain method of schooling and controlling him.

Mr. Littauer's concern is almost entirely with schooling and the application of the forward seat for schooling. He discusses the practical uses of the seat as shown in Olympic jumping, in fast work, and in other jumping. In

all fairness, he compares the forward seat to the schooling seat and admits that the latter has its uses. There is a complete discussion of schooling a horse, beginning with the early stages and working through to advanced equitation; throughout there is emphasis on the time and understanding necessary for successful schooling.

The book is suitable for adaptation to teaching in schools that are interested in jumping and have young horses to develop and sufficient pupils with ability, time, patience, and interest in developing good performing horses. With modification, it can be used as a guide wherever jumping and cross-country riding are taught.

PHYLLIS LININGTON
*Miss Linington's Stable*
*Milton, Massachusetts*

FIZJOLOGIA PRACY (PHYSIOLOGY OF WORK). V. Missiuro, M.D. (Warsaw, Poland: Institute for Social Problems, 1938) 308 pages, $1.00 (5½ zoty).

This is the first fundamental work on physiology of exercise ever published in Poland. The author has covered efficiently the enormous amount of literature which has accumulated in this field and presented it in a concise manner. It is difficult to find a better qualified man for such a task, because Dr. Missiuro is a noted investigator in physiology. He is head of the Department of Physiology at the Central Institute for Physical Education and of the Research Laboratory of the Scientific Council of Physical Education, Poland.

The aim of the book is not confined to physical education alone. It also deals with problems which are found in industry. Man can invent new machines to meet new demands, but he has to adapt his own body the best way he can to ever changing conditions. One of the purposes of this book is to show how this adaptation takes place.

The book consists of four parts: muscular system, respiration, circulation, and the effect of systematic exercise upon senses and functions.

Anyone seriously interested in the scientific foundation of physical education and with a sufficient knowledge of the Polish language, will find this book a fine source of valuable information.

PETER V. KARPOVICH, M.D.
*Professor of Physiology*
*Springfield College*

THE SCHOOL HEALTH PROGRAM. C.-E. A. Winslow, (New York: McGraw-Hill Book Company, 1938) 120 pages, $1.50.

Of the several reports of the New York State Regents' Inquiry into the Cost and Character of Public Education, the section on the evaluation of the school health program promises to be one of the outstanding contributions. The comprehensiveness of this report is without equal in the recent literature in the field of health, physical education, and recreation.

The scope of the program, and "the definition of health used in this study includes mental and social health in the widest sense; therefore even the broad implications of physical education may be considered a part of the health program."

The major divisions, as this Committee sees them, are as follows:

"A. Healthful school living: (1) sanitation; (2) mental hygiene.

"B. School health education: (3) health instruction; (4) physical education and recreation.

"C. Individual health supervision: (5) health services."

Each of the divisions, except mental hygiene, was defined according to the "Definition of Terms in Health Education" of the American Association for Health, Physical Education, and Recreation and is, therefore, not necessarily a new interpretation of the terms.

Sanitation problems fall into two classes: structural equipment and operating factors. An annual inspection by a local officer of sanitary conditions is suggested. To give effective leadership to this phase of the program, a Public Health Engineer is recommended, "whose business it shall be to visit the schools of the State, to record existing

conditions . . . , and to confer with principals, teachers, and custodians with reference to desirable improvements in practice."

Mental hygiene is a concern of the school for three reasons:

"First, it is the only social institution which has the privilege of contacting the entire population of children, and it is the primary agency through which modern concepts of human behavior can reach community thinking and practice . . .

"Second, it is in childhood that emotional attitudes are determined and the seeds of later maladjustment are sown. The school is second only to the family in importance with regard to child development . . .

"Finally, there is no fundamental difference between the ultimate goals of education and those of mental hygiene."

The effect of a comfortable, pleasant physical environment on mental hygiene is discussed in allegorical style quite adequately.

The general reactions of the administrative staff and the teaching staff affect the stage setting more than many are willing to admit. "A teacher infected with some communicable disease would normally be removed from the classroom, yet no consideration is given to the pernicious psychological influence exerted by the emotionally disturbed teacher." And the "most thorny problem of all—that of the unsuitable teacher now in service," is blamed upon "the laws of tenure, administrative procedure, and public opinion . . ." Tenure and administrative judgment have made tremendous problems out of the things they were intended to prevent.

The Committee fully realizes the varied subtle implications of the problem of mental hygiene and recommends definite attempts to meet the several problems mentioned. It also recommends "the appointment . . . of a well trained mental hygienist to map out and interpret a program and, so far as possible, to secure its acceptance," within the State Department.

Health Instruction in the Schools follows the same old story of legislation to include the teaching against the use of alcohol and narcotic drugs in the physiology and hygiene courses; then the textbook courses with direct teaching periods, and the so-called newer programs.

"The problem of health instruction is a peculiarly difficult one, since it involves a two-fold objective—the acquisition of basic knowledge of the fundamental principles of hygiene and physiology and the development of specific health habits and attitudes. The first is primarily a problem of the classroom, the second is intimately related to the health opportunities and health services provided by the physical educator and the school physician."

The best programs in health instruction are found to be conducted through the science departments. No mention is made of particularly effective teaching in health instruction by physical education teachers. This is a sign that should be noted by the teacher-training institutions throughout the country. Especially should the so-called academic teachers be given more adequate training in "health awareness."

"It would be premature to fix upon any single concrete plan for local health supervision. Controlled experimentation should be encouraged, and considerable diversity will always be desirable when local needs are concerned. The following desiderata appear, however, to be clearly indicated.

"*a*) Health instruction in every educational area should be under the direction of a single responsible individual, qualified in health content and in classroom technique.

"*b*) The work of such a supervisor of health instruction should be integrated as a part of the general supervisory program of the school system.

"*c*) Other phases of the school health program such as health service, physical education and recreation, nutrition, and the like, should be coordinated with health instruction through a regularly functioning standing committee including representatives of each of the fields concerned."

Physical education is "construed to

cover all forms of large-muscle non-vocational physical activities both intramural and interscholastic" and "must include instruction in the following types of activities, differentiated according to pupils' capacities, needs, and interests: (1) mimetics, (2) rhythms and dances, (3) games, (4) calisthenics, (5) athletics, (6) self-testing activities, (7) marching tactics, (8) dual combat, (9) gymnastics, (10) swimming, where facilities are available, and (11) miscellaneous physical activities including winter sports."

Adequate facilities for a satisfactory program seem to be necessary. Thirty-five per cent of 896 elementary schools surveyed maintained separate gymnasiums, 28 per cent combined gymnasium and auditorium, and 37 per cent had *no* gymnasium facilities. About half of the schools had inadequate outdoor facilities.

Part-time special teachers of physical education are found more frequently in the elementary grades than any other special teacher, though in most systems the classroom teacher conducts the greater part of the work. In junior and senior high schools special teachers in physical education are generally employed, and some of these teach other subjects as well.

The teaching loads of most physical education instructors were heavier than the general academic teaching load. The variability of load ranged from the same as that of regular academic teachers, to a full-time school-day load plus coaching of athletic teams in the various seasons. The Committee recommends "that teachers of physical education, including those who coach interscholastic athletic teams, should be on the same salary schedule as other teachers with comparable training and experience and that those who carry a heavy after-school program should have their school-time program correspondingly reduced."

The Committee has listed nineteen recommendations toward which progressive leaders in physical education have worked during the past decade. " . . . It seems that health service is the least effective of any of the phases of the health program studied." In most cases it has become merely the physical examination or inspection by a local physician, who is trained adequately in medicine, but usually untrained in the requirements of education as prescribed by the Education Law."

The absurdity of the daily health inspection is very aptly pictured. Classroom teachers look to the esthetic habits as indices of health, entirely missing the obviously ill, as long as the hair is combed, fingernails cleaned, and neck washed.

The appalling condition of adequate records is noted, and the Committee recommends study into this phase of the program. Other recommendations for this phase of the program center in these two points:

"1. A complete physical examination should be given three times during the period of school life and should be closely integrated with the general program of health education.

"'2. Remediable defects should be corrected if possible by the family physician, but where this proves impossible, at community expense. Where clinic service is provided, it should preferably be furnished by the health department or some other official or voluntary health agency, rather than by the board of education."

In the final chapter, Summary of Recommendations, the Committee has listed the objectives of the health program, which include a clear, concise statement of each section, and suggests seven specific changes in the Education Law which would make possible the execution of the recommendations of the Committee.

This report should be in the library of every health, physical education, and recreation worker as a ready reference for the most complete statement of the relationships yet published in one volume.

JOHN EDGAR CASWELL
*Assistant in Intramural Sports, University of Michigan*

# Life and Sustaining Members

## American Association for Health, Physical Education and Recreation

*Ainsworth, Dorothy, 15 Barrett Place, Northampton, Mass.

Anderson, W. G., M.D., Box 1902, Yale Station, New Haven, Connecticut.

*Bell, Margaret, M.D., University of Michigan, Ann Arbor, Michigan.

*Elliott, E. S., Dept. of P.E., Columbia University, New York City, N. Y.

*Gates, Grover, Rte. 1—484-C, Fresno, Calif.

*Giauque, C. D., George Williams College, Chicago, Ill.

Hermann, Ernst, 6 Everett St., % Sargent College, Cambridge, Massachusetts.

*Langton, Dr. Clair V., Dean, School of Health and Phys. Educ., Oregon State Agricultural College, Corvallis, Oregon.

*Lee, Mabel, University of Nebraska, Lincoln, Nebraska.

*Luehring, F. W., 435 Riverview Rd., Swarthmore, Pa.

*McCurdy, J. H., M.D., 93 Westford Ave., Springfield, Massachusetts.

McKinstry, Helen, Russell Sage College, Troy, N. Y.

*Metcalf, T. N., Dir. of Athletics, University of Chicago, Ill.

*Mitchell, Dr. E. D., University of Michigan, Ann Arbor, Michigan.

*Moore, Rodgers, P.O. Box 911, Visalia, Calif.

*Moorhead, W. G., New York University, N. Y. C.

*Moulton, Gertrude E., M.D., Talcott Hall, Oberlin, Ohio.

*Norris, Dr. J. Anna, 1429 East River Road, Minneapolis, Minn.

*Panzer College of Physical Education and Hygiene, 139 Glenwood Ave., East Orange, N. J.

*Siler, J. Granville, Dir. of P. & R. Ed., Porterville Union H. S. & Jr. College, Porterville, Calif.

*Sparks, Leslie J., Willamette Univ., Salem, Oregon.

*Stafford, Grace M., Secretary, Health Educ. Dept. Metropolitan Y. W. C. A., Chicago, Ill.

*Streit, William K., Dir. of Phys. Educ., Board of Educ., Cincinnati, Ohio.

*Swain, Leslie E., Brown University, Providence, Rhode Island.

*Life Members

# REPRINTS

## from past issues of the Research Quarterly

Q 159 THOMAS WOOD, *Philostratos: Concerning Gymnastics*.....

Q 160 DELMAR I. ALLMAN, *A Comparison of Nutritional Indices*.....

Q 161 DARWIN A. HINDMAN, *An Analysis of the Activities of Physical Education Teachers in High Schools*.....

Q 165 C. H. MCCLOY and EARL B. GREENE, *Bibliography of Health and Physical Education*.....

Q 165 HARRY D. EGGEN, *The Interests and Participation of Boys and Girls in Out-of-School Activities*.....

Q 169 BESSIE L. PARK, *A Comparative Study of Physical Education for Senior High School Girls and Boys*.....

Q 171 H. F. KLANDER, *Health Knowledge of High School and College Students*.....

Q 179 GLADYS BASSETT, RUTH GLASSOW, and MABEL LOCKE, *Studies in Testing Volleyball Skills*.....

Q 183 V. W. LAPP, *Absences from School—Influenza, Physical Education*.....

Q 184 M. W. HUSBAND and DAVID T. LOY, *Student Health Service*.....

Q 185 ARTHUR J. WENDLER, *A Critical Analysis of Test Elements Used in Physical Education*.....

Q 186 FREDERIC SCHIPPS BROWN, *A Further Study of the Analysis of Movement on the Basis of Latent Times and Variabilities*.....

Q 187 V. S. BLANCHARD, *A Study of First-Aid Procedures Followed by Certain Secondary Schools in Detroit and in Michigan*.....

Q 188 FRANKLIN M. HENRY and FRANK L. KLEEMEIER, *The Validity of the Pulse-Ratio Test of Cardiac Efficiency*.....

Q 189 R. F. VAN BUSKIRK, *The Use of a Student Inquiry Form for Evaluating a Course in College Hygiene*.....

Q 191 KENNETH ASHCRAFT, JANE HUNT, and GRANVILLE B. JOHNSON, *A Further Study of Recreational Therapy*.....

Q 192 PAUL D. GUERNSEY, *Experiments in Health Education at the College Level*.....

Q 193 FREDERICK W. COZENS, *A Fall Decathlon for Track Squads*.....

Q 194 RUTH GLASSOW and MARION R. BROER, *A Convenient Apparatus for the Study of Motion Picture Films*.....

Q 195 W. W. TUTTLE and RUSSELL E. DICKINSON, *A Simplification of the Pulse-Ratio Technique for Rating Physical Efficiency and Present Condition*.....

Q 195 AILEEN CARPENTER, *Strength, Power, and "Femininity" as Factors Influencing the Athletic Performance of College Women*.....

Q 197 LESLIE W. IRWIN, *A Study of the Relationship of Dominance to the Performance of Physical Education Activities*.....

Q 200 ALVIN ZANDER, *A Study of the Behavior of Boy Campers*.....

Q 200 FRANKLIN HENRY and DANIEL FARMER, *Functional Tests: II. The Reliability of the Pulse-Ratio Test*.....

*Order by number from*

American Association for Health, Physical Education, and Recreation
1201 Sixteenth St., Northwest Washington, D. C.